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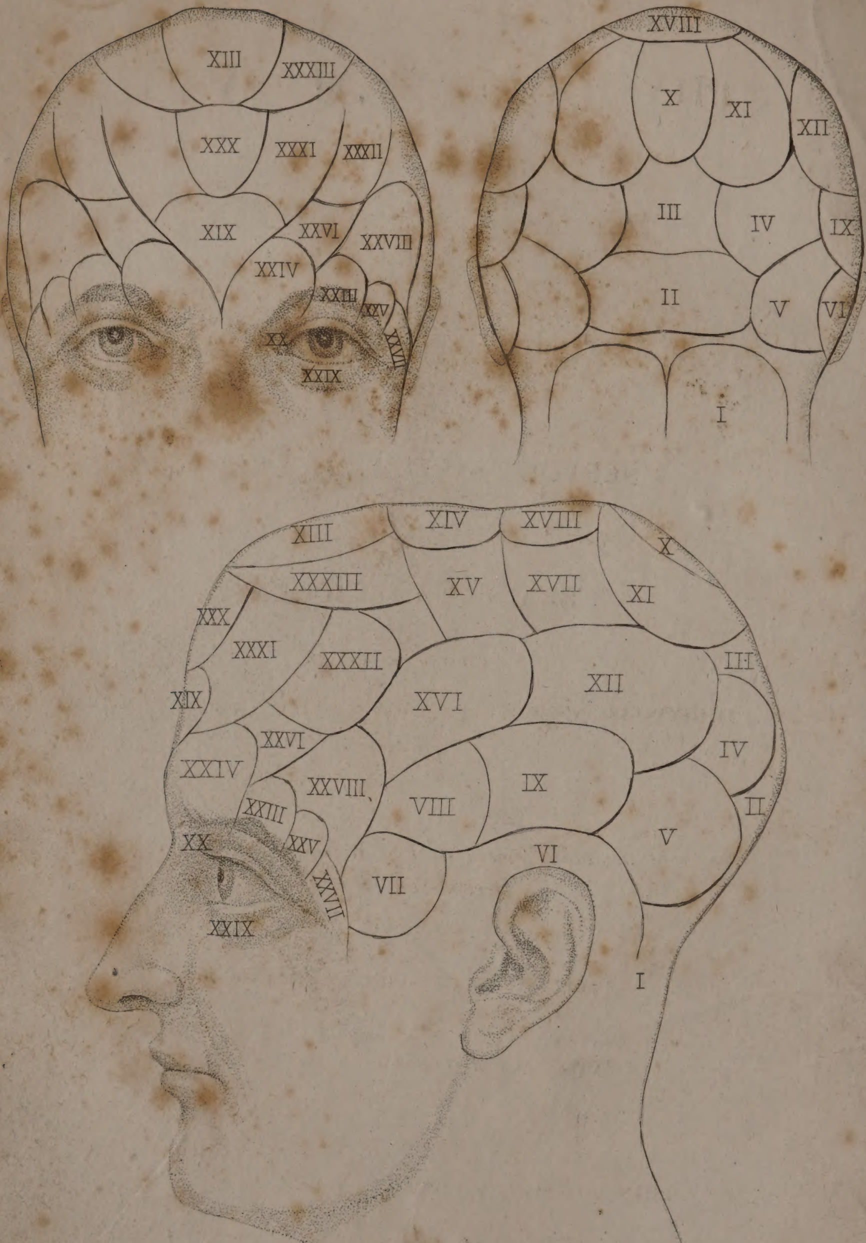

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THE PHYSIOGNOMICAL SYSTEM

OF

DRS. GALL AND SPURZHEIM;

FOUNDED ON

AN ANATOMICAL AND PHYSIOLOGICAL EXAMINATION

OF THE

NERVOUS SYSTEM IN GENERAL,

AND OF THE

BRAIN IN PARTICULAR;

AND INDICATING THE

DISPOSITIONS AND MANIFESTATIONS OF THE MIND.

By J. G. SPURZHEIM, M. D.

Being at the same Time a Book of Reference for Dr. Spurzheim's Demonstrative Lectures.

ILLUSTRATED WITH NINETEEN COPPER-PLATES.

THE SECOND EDITION GREATLY IMPROVED.

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TO

HIS EXCELLENCY

MAXIMILIAN COUNT MERVELDT,

GRAND CROSS OF THE ORDERS OF

LEOPOLD, ALEXANDER NEWSKI, AND ST. MAURICE,

KNIGHT OF THE MILITARY ORDER OF MARIA THERESA,

ACTUAL CHAMBERLAIN AND PRIVY COUNSELLOR OF

HIS IMPERIAL AND ROYAL APOSTOLIC MAJESTY,

GENERAL OF CAVALRY,

AND COLONEL PROPRIETOR OF A REGIMENT OF UHLANS,

COMMANDANT GENERAL IN MORAVIA AND SILESIA,

AND

AMBASSADOR EXTRAORDINARY

FROM HIS IMPERIAL AND ROYAL APOSTOLIC,

TO HIS BRITANNIC, MAJESTY,

In Testimony of the Author's Respect for the Faculties and the Knowledge which so eminently distinguish him, and in grateful Acknowledgement of the generous Attention and Kindness which the Author has experienced,

THIS WORK

IS MOST RESPECTFULLY DEDICATED.

PREFACE.

VERY few readers condescend to peruse a preface, especially if it be long. The present therefore shall be very short. I need allude only to two considerations, the *object* of our inquiries, and the reason why I call them *ours*. Our inquiries are of three kinds; anatomical, physiological, and physiognomical. At first indeed, Dr. Gall's chief intention was only to point out the functions of the brain. But, an exact knowledge of the functions of any organic part requires an examination of its structure; for physiology without anatomy is unfounded, while anatomy without physiology is useless. We therefore never separate anatomy and physiology. Moreover, anatomical and physiological inquiries as to the brain have led us to those of the five external senses, and of the nervous system in general.—The third kind of investigation is, in a natural order at least, the result of the preceding two. It is founded

on the possibility of distinguishing, by external signs, the different degrees of perfection in the nervous parts which are necessary to the manifestations of the special faculties of the mind, and to the activity of these faculties: such investigations are termed physiognomical. Hence, all the functions of man which are attended with consciousness, the external signs of these functions, and the structure of their respective organs—undoubtedly the most important part of anthropology—are the object of our investigations.

It is acknowledged that Dr. Gall has the merit of having first begun these inquiries. He had pointed out many relations which exist between various ACTIONS of man and animals, and certain cerebral parts, before I was so happy as to become acquainted with him. As, however, I have been associated in these examinations during many years, and have charged myself especially with the prosecution of the anatomical part; as I have not a little contributed and still continue to extend, to perfect, and to establish the new doctrine, Dr. Gall himself thinks it just to speak of OUR inquiries, and for several years past he has held this language. Hence the Memoir to the National Institute of

France, and the Large Work on the Anatomy &c. of the Brain, have been published under our joint names. This book itself will show how much I have improved our doctrine in the last few years, during which nothing else has been published on the subject. I am now also led to think, that the objects which are still to be added to our larger work must assume a more scientific arrangement, and to be considered in a more philosophical manner, than Dr. Gall has been accustomed to do in his lectures.

I here confine myself to the publication of outlines of our investigations, in order to give the English reader a correct view of our general doctrine, and to enable him to judge of its solidity and importance. The large work, entitled, *Anatomie et Physiologie du Systéme Nerveux en général, et du Cerveau en particulier, par Gall et Spurzheim, Paris*, of which the first volume and half of the second have been published, contains many more *anatomical* details, and these elucidated by a greater number of plates than I had the intention of introducing in this work.

Being aware that neither British philologists nor the British public are fond of admitting

new words, I must apologise for my daring to introduce a few new names. I foresee that the reviewers also may blame them. I therefore beg leave to observe, that while I do not wish to dispute unnecessarily respecting words I shall be obliged by the communication not only of every observation which may improve our knowledge of human nature, but of every one which may rectify the nomenclature of our philosophical ideas. Yet I shall pay no attention to any remark which indicates other intentions than scientific examinations require, or which may originate in individual motives. Let us never forget: *Nihil aliud natura, nihil aliud sapientia dicet.*

Having, however, formed some new names, it is my duty to state my reasons for having done so. The English language presents very few single words which express my conceptions of the peculiar faculties of the mind. Hence I was in some cases compelled either to speak by circumlocutions or to make names entirely new. Now I do think with Locke, that, in this respect, we have the same right as our predecessors, and I therefore propose new single names, which I have formed, as much as possible, in agreement with the spirit of

the language. Having established different propensities as peculiar faculties of the mind; in order to designate propensity, I have employed the termination IVE as indicating *the quality of producing*, and NESS as indicating *the abstract state*; I have therefore joined IVENESS to different roots or fundamental words; and in choosing these roots, I have always given the preference to English words generally admitted. When I could not find any such, I choose Latin participles, which, in English, are so commonly used even in expressions of meanings similar to those which I look for,—as destructiveness, productiveness &c.

Here I have further to make only a few particular observations. In the nomenclature of the PROPENSITIES, I dislike the name physical love, because this propensity is neither more nor less physical than attachment, or any other inclination common to man and animals; and I could not adapt certain other expressions in order to denote this propensity, because throughout this nomenclature I search for names which indicate the faculties, and by no means any determinate actions, whether in their use or their abuse. I have therefore adopted *Amativeness*, like destructiveness &c.——It was diffi-

cult to make a name for the second organ, because there is no single word which indicates the love of offspring. I have therefore employed two Greek roots in order to express it. I am aware that the name is long, but I could not say philogenitiveness, because the name ought to indicate love of producing offspring. As however progeny means offspring; philoprogeny, love of offspring, and *Philoprogenitiveness*, the faculty of producing love of offspring, I have adopted that term.——*Inhabitiveness* is composed of the English world inhabit, and the termination iveness.——It is true that *Adhesiveness* is generally used merely in a physical sense; but was not this originally the case with many other words which now bear a mental signification? Attachment would indicate only the effect of this faculty; and I require a name which may express the faculty of producing such effect. It was naturally my desire to give the same termination to all the names which denote any propensity; and it seems to me that the sound attachiveness would be infinitely more disagreeable than adhesiveness, the extent of the signification of which alone remains to be determined. *Combativeness* is the propensity to combat.—*Destructiveness* is ad-

mitted in the languge.—*Constructiveness* is, in our doctrine, the faculty of *producing* (not the being passively capable) of construction.—I know that *Covetiveness* is a pléonasm ; but this fault is observed in many other words which are employed without hesitation. Covet itself indicates propensity or wishing for ; and I have added *iveness* solely for the sake of uniformity : otherwise I should have said covetingness.—*Secretiveness* is the propensity to secrete or conceal.

The termination OUS indicates a SENTIMENT, as anxious, cautious, pious, conscientious &c. and I should have been very glad to find similar adjectives for every primitive sentiment of the mind. When that has been the case, I have only added NESS in order to express the abstract state, as cautiousness, conscientiousness, &c.

The names of the INTELLECTUAL FACULTIES are easily understood, and do not require any particular explanation.

If, under any head of this nomenclature, there be any better name, or one which may indicate more exactly any determinate faculty, but no determinate action or effect of that faculty, I shall be anxious to make use of it: for I am always disposed to acknowledge truth and every real improvement.

Every writer is aware that the best opportunity of arranging and perfecting his conceptions is to be derived from seeing them printed. This has been the case with me. I now prefer an arrangement which differs from that of the first edition. I begin, in the first part, with an examination of the *structure* of the nerves and brain.—In the second part, I give a general view of their *actions*.—In the third part, I treat of their *signs*—of phsysiognomy and pathognomy.—In the fourth part, I consider the application of these inquiries to philosophy—and I finish with some considerations on the influence of these investigations upon social intercourse, arts, education, criminal legislation, and medicine, so far as regards the derangements of the manifestations of the mind. As I am not sufficiently acquainted with the idioms of the English language, my friend, Alexander Walker, Esq. late lecturer at Edinburgh, has in his revisal taken the trouble to remove such Germanisms and Gallicisms as my manuscript, in the first instance, presented.

J. G. SPURZHEIM, M. D.

11, Rathbone Place, London,
June, 1815.

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PHYSIOGNOMICAL SYSTEM

OF

DRS. GALL AND SPURZHEIM.

INTRODUCTION.

THIS system is commonly considered as one according to which it is possible to discover the particular actions of individuals: it is treated as an art of prognostication. Such, however, is not the aim of our inquiries: we never treat of determinate actions: we consider only the faculties man is endowed with, the organic parts by means of which these faculties are manifested, and the general indications which they present. The object of this new psychological system, therefore, is to examine the structure, the functions and the external indications of the nervous system in general, and of the brain in particular. Thus does this science especially contribute to the knowledge of human nature.

It is sometimes asked, if such inquiries be useful. Every one must agree, that the knowledge of man is of the deepest interest; that the brain and nerves

are the most important of the organs of man; and that the greatest ignorance exists concerning these parts. Hence, inquiries of this kind cannot be unimportant. We examine all the beings around us: we divide and subdivide the different objects which nature presents to us: we study mineralogy, botany, zoology: why should we not study man, who manifests the greatest number of faculties, and who is lord of the terrestrial creation? Man, if considered merely as the most important being of creation, ought chiefly to interest every reflecting mind. As moreover we ourselves belong to this species of being, it must be of the utmost importance to know his nature. Among the Greeks the divine precept written upon the temple of Delphos was ΓΝΩΘΙ ΣΕΑΥΤΟΝ—Know thyself. Our interest in the knowledge of human nature increases in proportion as we live with men; as it is necessary that we should influence them; as we wish to direct them. All institutions must be calculated upon a knowledge of human nature: otherwise they cannot be permanent. Than this, indeed, it seems impossible to point out an object more interesting to natural philosophers, anatomists, physiologists, physicians, artists, teachers, moralists and legislators.

I do not pretend that the study of man has been neglected. On the contrary, reflecting men in all ages have thought it especially worthy of their attention. They have taken notice of the actions of the most remarkable individuals, as well as of men in general; they have inquired into the number and the nature of the faculties of man; and they have

invented many systems in respect to the causes of his actions. Though men, however, of almost every profession have thus endeavoured to elucidate human nature, it must be allowed that our knowledge of mankind is still extremely defective; and when we consider, that so many great men have investigated this subject, it is astonishing that so little progress has been made in it.

It would, indeed, be difficult to conceive this slow and limited improvement, if the manifold obstacles to scientific inquiry in general, and to anatomy and physiology in particular were unknown. Among these general obstacles, we may reckon the religious respect which men have for ancient opinions, and their aversion from new ones;—the obligation and the ease of maintaining adopted opinions;—our inaptness to think for ourselves;—the want of precision and clearness in our ideas and expressions;—the mania of forming systems upon a few solitary facts and hasty conceptions;—the jealousy, the envy, the falsehoods of opponents;—and their malice in drawing dangerous consequences from the most innocent statements.

The particular causes of ignorance in psychology may be divided into natural and artificial. Among the natural, the most important is the difficulty which the examination of mankind presents. It may be observed in general, that our knowledge is less advanced the more complex the object to be examined. It is easy to describe minerals, their volume, figure, weight, density, colour, and other physical qualities: this may also be done at leisure.

Hence mineralogy is eminently advanced. Inquiries concerning botany and zoology are more difficult; and these sciences are consequently less improved. For the same reason we are, even as to plants and animals, better acquainted with their physical qualities, than with their vital functions. Anatomy, being easier than physiology, is also more advanced. We may at our leisure describe and make drawings of animals; we may anatomize and preserve them with safety and ease; but it is not so easy to observe the facts concerning the life of animals, to inquire into their instinctive labours, their propensities, and their faculties.—Of the many books indeed, which treat on human nature, anatomical descriptions form the greatest portion. In anatomy the parts, in physiology the functions, the most easy to be examined, are the best known. It is infinitely easier to examine the bones and muscles, than the nervous system: anatomical and physiological knowledge of the nervous system and of the brain has, therefore, made the slowest progress. Till our days the external forms only of the brain were known; and the internal structure of its parts was quite overlooked. The physiology of the nervous system, and of the brain, shows only a succession of error, ever conformable to the prevailing philosophical system.

To anatomy there is a natural obstacle in the repugnance which men have, at all times, had to the dissection of the dead. The ancient Egyptians embalmed them; and the Greeks, Romans, Jews Arabs and Chinese were prohibited by religious

opinions from dissecting and examining them. Hence Hippocrates has often betrayed his ignorance of anatomy. Aristotle and the Roman anatomists were confined to the dissection of animals. Galen considered himself as being very fortunate, in having seen two human skeletons at Alexandria; and he recommended all those who intended to study osteology on the skeleton, to visit that city. In ancient times, indeed, the dissection of human bodies was permitted or encouraged only by the Ptolemies. Protected by these governors, Herophilus, Erasistratus and Eudemus made several important discoveries, which were however neglected or overlooked by their successors. The empirics entirely neglected anatomy. For that reason it was very remarkable that, in the year 1315, Mondini de Luzzi, a professor at Bologna, publicly dissected two dead bodies. Even in the fifteenth century, Montagna, a professor at Padua, acquired great reputation by having dissected fourteen bodies—an evident proof that the improvement of anatomy had been very slow, even after the restoration of letters in the preceding century. Even at the present day few persons permit the opening of a deceased relation; and physicians too much neglect such means of instruction. Thus, if we consider the want of opportunity to dissect, and especially the difficulty of dissecting the nervous system, we may conceive why the anatomy of that system has made so slow a progress. Moreover, in dissecting the brain, anatomists employ a method which is very unscientific. They cut the brain horizontally, vertically, or ob-

liquely, from above or from below, and remove it by slices. By this procedure, they merely destroy the organic parts, and their various and interesting connexions. Unacquainted with the origin of the nerves, and that of the brain—destitute of every physiological principle capable of guiding them—and neglecting the comparative anatomy of these parts, they have hitherto proceeded without any system. It was indeed impossible thus to acquire any idea of the natural connexion of the parts.

Physiology presents to the inquirer a still greater number of obstacles. Besides the natural difficulty of investigating the causes of the functions, there are many artificial obstacles.—The metaphysical notions of the schools have greatly impeded the improvement of anthropology. By the universal substitution of such metaphysical opinions for data furnished by the observation of nature, physiologists and even anatomists have regarded these opinions as sacred. The schoolmen, for example, say, the soul is simple, and therefore its material residence must be simple also, and all the nerves must end in one point; in other words, the nerves can have only one origin, because each individual has but one soul. Bonnet, Haller and others, having extended its seat to the whole substance of the brain, were thus contradicted by the metaphysicians, who did not reflect, that a little more or less of room could not enable them better to explain the nature of the soul; nor that, according to the remark of Van Swieten, Tiedemann and others, a material point, in which all ideas and sensations

should centre, is inconceivable, in consequence of the confusion and disorder which would result from such an arrangement. It appears indeed ridiculous that the observer, to whom all nature is open, should direct his researches and form his inductions by the guidance of such frivolous speculation. If, on the other hand, metaphysicians would observe natural facts, and ascertain the conditions on which they depend, their notions would no longer be at variance with the inferences of anatomy and physiology; and one science would not arrogate the right of setting bounds to the progress of another. The doctrine of a central point, and of a single origin, of all the nerves, is neither true nor possible; and this may be verified by examination. If, after this, the metaphysician cannot comprehend the unity of his individual consciousness, we ask him, whether he understands, in automatic life, how apparatus so different concur by their varied functions in forming one whole?—whether he can reconcile, in animal life, the existence of double organs with unity of function, and simplicity of consciousness?—whether he can comprehend any single power in the material world?

The chief of the artificial impediments to the improvement of psychology was the blameable method which had been employed in the study of human nature. All phenomena were explained by hypotheses or by the imagination alone. There exist, even at this day, philosophers, who maintain that man is not at all subjected to the laws of nature; that, independently of all causes and motives, he

may originate a series of actions, and that his functions do not admit of any explanation. According to this hypothesis, man is separated from all other beings; he is considered as a being entirely regulated by laws peculiar to himself. These schoolmen attribute all the operations of man to the soul: several of them even give to it an unbounded power over the body. This failure to compare man with other beings has been a great obstacle to the progress of psychology.—Moreover, the various branches of anthropology, instead of being united, are cultivated separately. The useful example of the Greek philosophers is neglected. Anatomy, physiology, medicine, philosophy, education, religion and legislation, instead of uniting their mutual influence, constitute so many particular doctrines or sciences.

We may now ask, To what profession does the examination of human nature especially belong? Several persons cannot conceive why a physician should speak continually of the knowledge of human nature; but no profession is more interested in, nor more fit for, such examination. It is the particular duty of the physician to consider the diseased state of man; but it is evident that a knowledge of the healthy state must be the foundation of a knowledge of the diseased state: that is, pathology must be founded upon physiology. It is impossible to understand any derangement of the functions if we are unacquainted with their regular state. Hence all physiological inquiries are intimately connected with medicine.

It cannot be doubted that, considered even in itself, the most important part of man is the nervous system; and, with relation to other parts, our inquiries into that system in general, and the brain in particular, must also be the more important, the greater the influence which these parts exert upon all the operations of the animal economy. Now in man, and the more perfect animals, the manifestations of all the faculties are more or less subordinate to the influence of the nervous system. The functions of digestion, circulation, respiration, nutrition, secretion and excretion, are deranged or annihilated, when the nerves, which co-operate in the performance of these functions, are compressed, wounded, or destroyed. The chemical changes in the alimentary canal during digestion are the more sensible the less the nervous power is active. The nerves distributed to the organs of sense, and to the muscles, are indispensable to the performance of their functions. On parts situated below the division of a nerve, impressions are no more perceived; and the principle of motion can no more be directed towards the muscles with which it may be naturally connected. We shall also see that, besides the functions of the five external senses, all the instincts, propensities, sentiments and intellectual faculties, all the affections and passions, all the characteristics of humanity, are manifested only by means of the nervous system. Hence we must acknowledge, that without the physiology of the nervous system, there would be neither psychology nor any species of philosophy; and that it is impossible to find any object

of greater importance than this, or more durably interesting to philosophers, physicians, moralists, teachers, judges and legislators.

Hence it is obvious, that physicians, who study the influence of the nervous system, are especially interested in contributing to the knowledge of man; nor, in consequence of the influence of affections upon the functions, does the practice of any profession make us feel so intimately the necessity of knowing both his physical and his moral state. Who, for instance, has not observed that grief, jealousy, envy, hopeless love, and painful affections of similar nature, consume the principle of life? Moreover, the examination of the nervous system, and of its influence, interests physicians, chiefly because all the alienations of the mind have their primitive cause in the mediate or immediate derangement of the brain and nerves; and, in pointing out the conditions necessary to the manifestations of the moral sentiments and intellectual faculties in the healthy state, we contribute also to the elucidation of mental diseases. Thus, in discovering the nature of man, no one is more interested than the physician.

Fortunately no profession is better prepared than that of the physician to investigate these subjects by accessary knowledge, and by the study of nature in general; nor is any one so frequently and so seriously admonished by nature to revise opinions, and to forsake hypothetical reasoning in order to follow the simple methods of experience. No philosopher is more intimately convinced, that all our

knowledge ought to be reduced to a rational mode of judging from experiment and observation. The physician, moreover, is placed in circumstances the most conducive to a profound and certain knowledge of man. No one has such facility of observing men at all times, and in all situations, when liberated from, when incapable of, habitual restraint and ceremony. The physician alone has an opportunity of being, during the night or the day, witness of the most intimate relations, and the most secret events of domestic life. Good and bad men, when sick, with difficulty conceal from him their true sentiments. Who desires not the friendship of the man whom he trusts with his own life, with that of his wife, or of his children? To such a man, supposed to know all that belongs to our nature, we unfold the most secret thoughts, and we acknowledge our frailties and our errors, in order that he may judge truly concerning our situations. There is consequently no profession more entitled or more compelled to study mankind, than that of medicine.

PART I.

(To be omitted by the more popular Class of Readers.)

ANATOMY OF THE BRAIN AND NERVES.

AS anatomical structure precedes in existence every kind of function, I shall, in this first part of my work, give a sketch of our anatomical inquiries into the nervous system in general, and the brain in particular. Those however who feel no interest in these investigations may pass over this chapter, and begin with the Physiological considerations in Part II, or even with the Physiognomical ones in Part III.

I have already mentioned the slow progress of the anatomical knowledge of the brain and nerves, though, from the earliest antiquity, anatomists, convinced of their importance, have inquired into their structure. I have also pointed out the reasons of this. I now continue the elucidation of the subject.

In examining the structure of the nervous system, our whole procedure differs from that of other anatomists. The method of demonstrating the brain, commonly employed in anatomical schools, is in every view defective. No idea could be formed of the structure of any one organic part, if its dissection were performed by slicing, as is done with the

brain. Who could understand the structure of the muscles by a demonstration of their transverse sections? Guided always by physiological and pathological vews, we begin the examination of every cerebral part at its origin; and by scraping aside the nervous substance, we follow the general course and the particular direction of the fibres. In this way we easily perceive their successive increase, the addition of new parts, and their various connexions. We also discover the form, consistency and colour of the nervous parts with more facility than by cutting and slicing them. This method, therefore, should be preferred even by those anatomists whose only aim is the mechanical form of the organization. It is of indispensable necessity to our considerations, unconfined as they are to mechanical form, and connected with physiological and pathological views.

In our anatomical inquiries, the origin of the nervous system is the first consideration. Is there one common origin of all nerves, or are there various origins? Anatomists and physiologists in general speak of a common origin of the nervous system: they consider the brain as the origin of the spinal marrow and of the nerves, and view all these parts as one homogeneous mass. We are of opinion that the nervous system must be divided and subdivided, and that each part of these divisions and subdivisions has its particular origin.—Anatomists speak commonly of four parts of the nervous system: of the great sympathetic or intercostal nerve, of the spinal marrow, of the cerebral nerves, and of the

brain itself. Several anatomists, as Winslow, Soemmerring and Cuvier, have pointed out the impropriety of deriving the great smypathetic nerve from the brain and the spinal marrow: they have considered this nervous apparatus as existing independently. Bichat has even maintained, that the intercostal nerve is not in itself one; but that it must be considered as composed of various parts which take their separate origins from the different ganglia dispersed through the abdomen and thorax. He mentions also the differences which may be observed between the great sympathetic, and the other nerves of the body. The fibres of the former are greyer, thinner, softer and more numerous, while the fibres of the other nerves are whiter, thicker, more solid and less numerous. Comparative anatomy indeed clearly proves, that the nerves of the abdomen and thorax are not the continuation of the spinal marrow and the brain. For, while no nerves have been detected in zoophytes, they exist in those animals which have distinct vessels and an intestinal canal, taking, in them, their origin from various ganglia; and, as these animals are destitute of a spinal marrow and brain, the nerves cannot arise from them. Now as the nervous systems of the viscera of the lower classes of animals are analogous to similar systems performing similar functions in higher classes; that is, as the nerves of these animals correspond to the nervous plexus of the abdomen and thorax in the higher animals, and to the series, more or less interrupted, of the ganglia of the sympathetic nerve,

it is demonstrated that this apparatus exists independently and of itself. Thus, do we consider the intercostal nerve as composed of different parts which have their separate origins, and are in communication with each other, with the spinal marrow, and with the brain.

Even the spinal marrow, and the pretended cerebral nerves, are not continuations of the brain, nor is one part of them a continuation of another; but the spinal marrow, every pair of its nerves, and every pair of the pretended cerebral nerves, have their peculiar origin. For the brain is in proportion neither to the spinal marrow, nor to the pretended cerebral nerves; which ought to be the case if they were continuations one of another. The brain of a horse, ox, or stag, is smaller than that of man, while its spinal marrow and nerves are far larger than the same parts in man. Hence the brain is the origin neither of the spinal marrow nor of the nerves. Certain monsters of the human species, and of the higher animals, are born without a head, and are yet provided with nerves, and a spinal marrow. Sometimes the head, the upper parts of the body, and the thorax, are wanting, and yet the inferior parts have nerves. Haller, Soemmerring and many authors speak of such monstrous fœtuses. I have dissected three monsters consisting only of the lower half of the body, from the umbilical cord downward. The last, which I examined not long ago, is in the possession of Mr. Norman of Bath. All its parts are tolerably perfect. There is in it a corresponding portion of spinal marrow, rounded at

the upper extremity, and enclosed in *dura mater*. The lower limbs contain the usual nerves. Even a leg, if it be born alone, is provided with them. Hence the brain cannot be their origin.

Certain authors support the opinion as to the origin of the nerves from the brain, by saying with Morgagni, Haller and Sandifort, that a dropsy of the brain, after having destroyed that mass with its membranes and bony coverings, is the cause of the dissolution and absorption of all the parts which are wanting. But no acephalous or headless fœtus, either incomplete or complete, that is, either, where the basis of the skull, the inferior parts of the brain, and the nerves exist, or where the whole head is wanting, shows, at birth, any traces of such destruction. Instead of observing any erosion, the edges of the bones are smooth, and thicker than in the perfect fœtus. Besides; if the water, whether that of the amnios or that which is accumulated in the brain, can dissolve membranes and bones, why do the soft nerves of smelling, seeing and hearing, resist this destructive power? Moreover, since it is admitted that other parts of the body, as legs, hands, arms, &c. may be wanting from a primitive defect of organization, why should an exception be made in respect to acephali, and recourse be had to dropsy, in order to explain the deficiency of the brain and the skull.

Other persons, who maintain that the brain is the origin of the nerves, explain the existence of acephali by an increased pressure, inducing the absorption of the parts. It may indeed happen, that strong

pressure hinders the nutrition of a part, and the deposition of new matter, during the continuance of the absorption; and consequently in this manner a compressed part may diminish, and even disappear. Who shall however determine the duration necessary to produce this effect? Moreover, I do not understand how the uterus can produce pressure upon the head without counter pressure upon the opposite parts: yet these parts are not absorbed at the same time. In the same way it is inconceivable how pressure could act only upon the arms, legs, or upon any other limited part. How shall we find in pressure an explanation of the want of interior parts, while the whole surface of the body is entire? Finally, while the fœtus swims in the water of the amnios, it is quite impossible that any pressure should take place. Hence, acephali must be considered as the result of an organization originally defective.

The direction of the fibres of the spinal marrow, and of the pretended cerebral nerves, clearly proves that they are not prolongations of the brain; and that no one pair of nerves is a prolongation of another. The direction of the pretended cerebral nerves is evidently from below upward. (*Pl.* I. *fig.* 1. 10, 12, 13, 15, 20, 23.) Every pair of the spinal nerves is composed of different bundles, several of which, in animals, have their direction from below, upward and outward; others from above, downward and outward. Hence, the nervous bundles come neither from the superior nor inferior extremities of the spinal marrow; but every pair of

nerves has its origin at the place, whence the nervous bundles go. This is evident also by the size of the different parts of the spinal marrow, which are not in proportion one to another. The spinal marrow is large or small, in proportion to the size of the nerves which arise at different parts of it: it is, for instance, larger at the places where the great nerves of the arms and legs have their origin; and is smaller at the places where the smaller nerves of the back go off. It is in consequence of this independent existence of the nerves, that the number of their pairs from the spinal marrow varies extremely, not only considered collectively, but also with reference to the particular number of the vertical, dorsal and lumbar pairs.

This consideration relative to the independence of the nervous substance must also be applied to the various parts of the brain. Thus the different parts of the brain and of the spinal marrow, the pretended cerebral nerves, and the nerves of the abdomen and thorax, have no common origin; but every part has its separate origin. The various parts are brought only into communication with each other.

It is obvious that the form of the whole nervous system must be different in different animals, and conformable to the form of their different bodies. If an animal, for instance, have a round form, the arrangement of its nervous system must be different from that of an animal which is long.

The nervous system in general, and the brain in particular, consists of two kinds of substance; namely of a cineritious, and of a white substance.

The cineritious or grey substance is pulpy, gelatinous, sometimes softer, sometimes harder, more or less whitish, yellowish, reddish, or blackish, and without apparent organization. It contains so great a number of blood vessels, that certain anatomists have deemed it a tissue of very small ones; but Albinus, and after him Soemmerring, has proved by injections, that there is also another substance, which is probably secreted by these vessels. Other anatomists have supposed that it is destined to secrete a nervous fluid. We consider the grey substance as the matrix of the nervous fibres.

It is objected that all organic parts are produced and nourished from the blood. This is true: it does not however always happen immediately, but also mediately. We accordingly find, that various organic parts take origin immediately from a soft greyish substance, and only mediately from the circulating fluids.

Plants spring from a soft substance. In trees, wherever a branch originates, it first happens that a certain quantity of greyish substance is deposited from the sap, and that then from this substance fibres arise. These fibres are next by one extremity brought into communication with the trunk, and by this means with the roots; and by the other extremity they form the branch. The new branch, therefore, is not the continuation of the inferior ligneous fibres, or of the roots; it is brought only into communication with them. This is also evident from the consideration that all the branches taken together would constitute a larger mass than the trunk or the

roots. The mutual influence of the roots and branches is sufficiently explained by the communication of these parts; and therefore it is, that the injuries of the roots do harm to the branches, and *vice versâ.*

The bones of animals have their origin in a similar way. A cartilaginous mass precedes the bony substance, and this latter is deposited in the former. Just so in the nervous system, it is the grey matter which acts sooner than the white fibrous substance. At first, the whole fœtal brain consists of a cineritious mass, and by degrees only it is that even fibres appear; and then they appear at certain places sooner than at others, the nervous fibres always going off from the cineritious substance. There is moreover an uniform proportion between the grey substance and the nervous fibres which are derived from it. Even in worms, insects and crustaceous animals, the ganglia wherein nervous fibres arise, contain a proportionate quantity of greyish substance. This substance is sometimes accumulated at particular places, and sometimes it accompanies the nervous fibres in their course. These circumstances equally occur in the cerebellum and in the brain. Every nervous part has its origin in a proportionate quantity of cineritious matter. From these considerations we infer, that the nervous filaments are originally produced from the cineritious substance.

The opinions of anatomists, concerning the structure of the white substance, are also very various. Some have taught that it is solid; others maintain

that it is hollow: some, that it is absolutely destitute of vessels; others, that it is entirely composed of them: a great number think it resembles marrow: very few anatomists know that it is fibrous; yet this is in fact its structure.

The objection, which is opposed to the fibrous structure of the brain, is, that we do not see the fibres when we cut the mass. Sometimes, according to their expression, it *seems* fibrous; but this is, say they, the effect of drawing and pulling this coriaceous mass; and though filaments have been observed also by other processes, this happened, continue they, in consequence of chemical preparation, or of an alteration after death. Such assertions are quite unfounded. In the first place, it is quite impossible to discover the true and fibrous structure of an exceeding fine and soft mass by cutting it. Proceeding in this way, we fail to discover this structure even in those cerebral parts which are manifestly fibrous—in the pyramidal bundles, for instance, and in the great commissure. The fibrous structure may however be proved by other means. In dropsy of the brain, the fibres are very distinct. If, in the healthy brain, without any preparation, by means of a syringe we direct a stream of water on a convolution, and thereby separate its two layers one from another, we may see their fibres thoughout their whole expansion. The same result follows if the convolutions of the brain be boiled in oil, or be macerated in nitric or in muriatic acid diluted with alcohol. Moreover, when we merely scrape the white substance in the

direction of the fibres, we can, with the naked eye, follow them into the grey substance of the convolutions; but when we scrape cross-ways or side-ways the fibres are pulled out of their natural direction, and they visibly break off. If then the fibres were the product of coagulation after death, how should it happen that agents so opposite as the water of the dropsy, alcohol, vinegar, mineral acids, boiling oil, and even intense cold, act in a uniform manner upon it. Why, in the convolutions, is the white substance coagulated in fibres, which run perpendicularly from the basis upward? Why, in other parts, is it in horizontal, circular, crossed, interwoven, or diverging fibres? Why do the fibres always possess the same form in the same parts? The only rational answer is, that the white substance is fibrous, and that these are its natural directions.

These considerations show that the name medullary substance is false. This expression excludes the idea of fibres; and the functions of the nervous fibres have no analogy with the functions of the medulla. Therefore, we always say, nervous mass or nerves; and we name them according to the parts they belong to: for example, instead of spinal marrow, we say the nerves of the spine, just as we say, nerves of the stomach, of the lungs, &c.

I shall now describe the most remarkable parts of the nervous system.—The nerves in general may be divided in the same way as their functions. Thus certain functions must be considered as the result of the organization alone; and others as taking

place with consciousness, and being the effect of the mind. The former class of functions constitute organic or automatic life; the latter, animal life.

The nerves of automatic life consist of the nerves of the abdomen and thorax, into the particular description of which I shall not enter. I have proved that they exist by themselves. I need only add that they are brought into communication with all the nerves of animal life.—The nerves of animal life may be subdivided into four orders; into the nerves of voluntary motion, those of the five senses, those of the propensities and sentiments, and those of the intellectual faculties. Till the present time, the difference between the nerves necessary to voluntary motion and those necessary to the sense of feeling has not been demonstrated; but, by several anatomical, physiological and pathological proofs, I am convinced of its existence. This difference has been sought for from ancient times, in which Herophilus was the first who spoke of it. In modern days, Reil has stated that the medulla of the nerves produces sensation, and their investment, motion; but entire nerves—nerves consisting of both these parts—are distributed to the muscles in which there is motion, or to the skin in which there is sensation.

I admit a difference between the nerves of motion, and those of feeling; because the same nervous fibres do not go to the muscles and to the skin, and each of these parts perform peculiar functions. The nerves necessary to motion cannot propagate the impressions of the sentient nerves, nor these,

the impressions of the nerves of motion. These latter produce only the feeling of pain, as do the nerves of automatic life. Muscles do not feel temperature nor moisture: they feel only fatigue. There is, however, no proportion between feeling and being fatigued: it is possible to have acute feeling and to be fatigued. Muscles receive their impressions from within; and nerves of feeling, from without. Moreover, there is no proportion between the size of muscles, and the sense of feeling. The nerves of feeling are only assisted by the nerves of motion, in the same way as the nerves of all other senses. That is; if internal faculties act upon external impressions by means of the five senses, they make use of the organs of motion. Is not the tongue, for this reason, provided with three kinds of nerves, *viz.* with nerves of motion, of feeling and of taste? The diseased state also proves the difference between the nerves of motion and those of feeling. Voluntary motion is sometimes impossible, while feeling is preserved or even increased; and sometimes feeling is lost, while voluntary motion continues. From these observations I infer, that the nerves of motion and those of feeling are different.

It may be replied, that the nerves of motion and feeling arise from the same trunk, consequently that they are not different. This conclusion is erroneous, and the contrary is evident from the fifth pair, the various fibres of which perform different functions, *viz.* motion and taste. The spinal nerves are also composed of different original bundles, the func-

tions of which may also be different. According to this view, the spinal marrow consists of nerves of motion and of feeling; and the greater number of the pretended cerebral nerves belong to the nerves of motion or of feeling.

In respect to the nerves of motion and of the five external senses, I have already proved that they exist independently, and cannot be considered as the continuations of the white substance of the brain and cerebellum. I need enter only into some considerations relative to their particular structure.

ON THE SPINAL NERVES.

The term spinal marrow has been used in a vague manner by different authors. The natural limit of this nervous mass appears to be at the lower extremity of the pyramidal bundles. (*Pl.* I. *fig.* 1. 1.) It must be considered as a series of enlargements, in which respectively arise the various pairs of nerves. There is in this respect an analogy throughout all those classes of animals whose nervous system presents an arrangement generally longitudinal. In the worms and caterpillars there are as many origins of nerves or ganglia, as there are superficial rings or segments. These ganglia or knots are joined to each other by nervous branches, and thus form a cord studded with small tumours of various forms and sizes. The number and size of the nervous threads arising from these swellings are always proportionate to the size of the swellings themselves. In the spinal nerves of fishes, amphibia

and birds, there is in this respect no essential difference from those of worms and caterpillars; except that the ganglia are in general closer to each other, and form, with their uniting bands, a cord nearly equal in size; still, however, swelling in distinct knots wherever large nerves go off. The same law is preserved even in mammalia and in man, although in man the swellings are not so immediately evident. But even in him, these successive swellings, corresponding to the origin of the nerves, may be seen by removing the spinal marrow, detaching its arachnoid coat, and observing its profile when held against the light. The largest swellings exist where the nerves of the extremities go off; but the line being every where more or less undulatory, they are sufficiently visible throughout.

The interior structure of the spinal marrow is not well understood. There are evidently two fissures, one in the midst of the anterior, and another in the midst of the posterior side; but there are no lateral fissures. The anterior fissure is wider and more visible; the posterior penetrates more deeply. The anterior fissure has also the peculiarity of being interrupted by the decussation of the pyramidal bodies. These two halves of the spinal marrow are united at the bottom of each fissure by a nervous layer: the fibres in the anterior fissure being transverse; and in the posterior, longitudinal. The nerves of the spinal marrow originate in the cineritious substance which is found in the interior of each side of the cord, and forms two arcs which

pass towards the anterior and posterior surface. The nervous fibres follow the course of these arcs from within toward the surface, throughout the whole length of the spinal marrow; so that we have on each side two rows of nerves, an anterior and a posterior. The posterior ones are more considerable, and therefore it is that the posterior fissure penetrates more deeply.

ON THE PRETENDED NERVES OF THE BRAIN.

There can be no dispute about the origins of the accessory (*Pl.* I. *fig.* 1. 2—3), hypoglossal (*Pl.* I. *fig.* 1. 4), vocal (6), and glossopharyngeal (7) nerves. In this respect, they bear a close resemblance to the nerves of the spine. They have this particularity, that their filaments before they quit the mass, unite into one band, which evidently runs directly upward, sometimes more, sometimes less visibly, according as it is more or less covered by neighbouring bundles. We must not, however, in these nerves confound the point of origin, with the point of departure from the mass.

The abductor nerve (*Pl.* I. *fig.* 1. 10) is seen clearly, in herbivorous animals, arising, at some distance behind the pons Varolii (*Pl.* I. *fig.* 1. *b b*), from a small band which ascends between the corpora pyramidalia (1—*c*) and olivaria (*a*). It is only on account of the greater breadth of the pons in man, that this nerve approaches to its posterior edge.

The facial nerve (*Pl.* I. *fig.* 1. 11) goes off at

the angle formed between the pons Varolii, and the corpus restiforme (*e*—*e*). In herbivorous animals, the roots of this nerve may, according to Mr. Walker's observations, be deeply traced, as two strong and glistening cords passing through the whole thickness of the medulla oblongata.

The auditory nerve (*Pl.* I. *fig.* 1. 9) comes from the medullary streaks on the surface of the fourth ventricle, and increases into a small grey and slightly prominent band placed transversally upon the corpus restiforme. This band is proportionate to the size of the auditory nerve, and to the acuteness of hearing in different animals.

The roots of the par trigeminum (*Pl.* I. *fig.* 1. 12) may be traced to above the corpora olivaria (*a*). This fact was observed by Santorini, but has been overlooked by modern anatomists. The breadth and thickness of the pons in man were the obstacles to its being sooner discovered. As, however, this part is much smaller in animals, the roots of the fifth pair are easily traced. In fishes, amphibia and birds, it is quite detached from the cerebral parts.

The optic nerves (*Pl.* I. *fig.* 1. 20) have a very different origin from that which is commonly assigned to them. The greater number of anatomists derive them from the thalami, although in former times Santorini, and, at the present day, Hildebrand, Soemmerring and Boyer have stated, that they arise, in a great measure, from the nates. In brutes, particularly in the horse, calf and sheep, it is very evident that the anterior pair of the tubercula quadrigemina gives, on each side, origin to a

broad band of nervous fibres, which bends round the outside of the thalami, and appears to receive a small addition from the corpus geniculatum externum, where it ceases to adhere, except at its external edge. It then proceeds toward the forehead, and is closely attached to a layer of grey matter, called by some tuber cinereum, receiving from it several new filaments. Here it meets the nerve of the opposite side, and according to the opinion of the most enlightened anatomists, decussates that nerve. Yet this decussation is denied by others, who allege reasons which are less powerful. In different animals we have seen that, after blindness which had lasted for many years, the nerve of the affected side had diminished in size as far as the union, that from this point the change had continued along the nerve of the opposite side, and that the nates of this same side had also considerably diminished. It is moreover evident that the thalami are not the origin of the optic nerves. There is no proportion between the size of the optic nerves and of the thalami. The latter are much smaller in the horse, cow and stag, than in man, though the optic nerves of these animals are much larger; but the proportion between the optic nerves and the nates is always preserved. From the brain of birds it may be clearly shown that the thalami do not belong to the optic nerves. Anatomists have strangely confounded, in fishes and birds, two round tubercles with the thalami in mammalia, though in fishes and birds the hemispheres contain the same parts as in mammalia. In these only one band of superficial

fibres, on the outside of the thalami, contributes to the formation of the optic nerves. All the rest of them belongs to the brain, and particularly to the organs of propensities and sentiments. Anatomical inquiries clearly demonstrate this organization. At Paris I examined a brain in which the thalami were destroyed by suppuration; but the optic nerve preserved its natural size proportionate to its fellow of the other side.

The origin of the olfactory nerve (*Pl.* I. *fig.* 1. 23) has not yet been demonstrated. There exist three roots (18, 19, 21) in different directions, but I have not yet been able to observe its primary origin. It is certain that neither the testes nor the corpora striata are its origin, because the brains of the cetacea, though destitute of this nerve, have yet testes and corpora striata. It is also an error to suppose that the relative magnitude of the nates is larger in herbivorous, and that of the testes in carnivorous animals.

CEREBRAL MASS.

Natural order now leads us to the examination of the cerebellum and the brain. The ideas which have prevailed, respecting what may properly be called the brain, have been, till the present time, very indeterminate. Certain anatomists confine the term brain to the convolutions and hemispheres. Others extend it to the whole nervous mass contained in the skull. Others again suppose that even the medulla oblongata and spinal marrow are pro-

longations of the brain and cerebellum: and they give to all these parts the common name encephalic mass (from the Greek ἐν, *in*, and κεφαλὴ, *head*). In order to fix the meaning of our terms, and to avoid all confusion, we call cerebral the whole nervous mass which is joined to the nervous systems, performing voluntary notion, and the functions of the five senses.

The cerebral mass is commonly divided into two principal parts; namely, the superior, consisting of the two hemispheres, and called the brain; and the inferior, which, being in general much smaller than the superior, is called cerebellum or little brain. The cerebral mass may also be divided, according to its functions, into two parts: into the organs of the propensities and sentiments, and into those of the intellectual faculties.

Anatomists have observed in the medulla oblongata three eminences: the corpora pyramidalia (*Pl.* I. *fig.* 1. 1—*c*), olivaria (*a*), and restiformia (*c*—*e*); or the pyramidal eminences, olivary tubercles, and restiform bodies, thus naming them according to their mechanical form. The medulla oblongata, however, contains various bundles which are composed of fibres. These bundles are augmented by new fibres, which arise from a grey substance, and are joined to the inferior nerves; that is, the original fasciculi of the cerebellum and of the brain are thus brought into communication and reciprocal action with the nervous system below them.

The mode of this communication is not the same

in all these original parts of the cerebral mass. Except the anterior pyramidal eminences, all the other fasciculi of the brain, as well as of the cerebellum, arise on the same side, of which they become cerebral parts, and they communicate with the nervous systems of the same side of the body; but it is quite different with the anterior pyramidal eminences. The fibres of these eminences cross or decussate each other, each going to the side opposite to that from which it originates. Just at the spot where the medulla oblongata, or the great occipital enlargement, begins to swell at its lower part, at one inch and a few lines below the pons Varolii (*Pl.* I. *fig.* 1. 1), let the arachnoid and vascular coats be divided by a superficial incision, not extending into the subjacent parts, and be then carefully removed. If then the edges of the groove, which runs in the middle, be gently separated, there will be seen three, four, or five threads crossing each other, passing obliquely from below upward, and occupying a space of about three or four lines in length. Thus the nervous threads, arising in the cortical substance on each side, pass respectively to the opposite side, so as to produce a decussation of the pyramids. These primitive threads of the pyramids vary in number and size: they are five, four, or three in number; and sometimes the primitive fibres, instead of forming an intertexture of this kind, present bands which pass obliquely to the side opposite to that from which each comes. The decussation is constant; but the form and size of the crossing fibres vary.

This structure of the pyramids was known to some of the ancient anatomists, as to Mistichelli, Pourfour du Petit and Santorini; but it has been overlooked or denied by modern anatomists. It explains why injuries of the head influence the opposite side of the body; and as only a part of the brain, namely the continuation of the anterior pyramids, is by decussation in communication with the nervous mass of the body, it is evident and easily understood, why palsy of the body, or convulsions, produced by injuries of the head, are observed sometimes on the opposite, and sometimes on the same side.

CEREBELLUM.

The cerebellum is the lowest part of the cerebral mass (*Pl.* I. *fig*. 2. I). It immediately follows the spinal nerves. In the lower orders of animals, and in birds, the cerebellum is single, but always composed of two distinct halves. In fishes and reptiles, however, no division of the cerebellum is perceived; and if, in them, it be cut perpendicularly, it does not present the arbor vitæ. In birds, the external surface of the cerebellum presents semicircular rings and ridges; and if in them it be cut perpendicularly, the arbor vitæ is visible. In viviparous animals, the cerebellum is no longer single; lateral parts are added; and the first part becomes the middle portion, as Reil terms it. This denomination, however, seems less adapted to it than that of fundamental portion, because this

portion exists in all animals, even in fishes and reptiles, where there are no lateral parts.

Nature observes always the same type in the formation of the cerebellum. The cerebellum of man, therefore, though complicated and perfect, still presents the common elementary form. The first visible roots of the cerebellum spring out of the grey substance, situate in the interior of the large occipital swelling (medulla oblongata). These roots form on each side of this swelling a fibrous cord more or less considerable. This cord thickens continually as it ascends (*Pl.* III. *fig.* 1 & 2. *e e*). Near the cerebellum it is covered by the auditory nerve and by its ganglion, which by certain anatomists is called the grey band. After having by scraping, or by the handle of the scalpel, cautiously removed the auditory nerve and ganglion, we, in following the direction of the fibres, see on each side the whole cord enter the interior of the hemisphere of the cerebellum. It has scarcely advanced a few lines, when it meets an accumulation of grey substance, and forms with it a tissue, so dense, that it is impossible to pursue in it the direction of the nervous filaments (*Pl.* III. *fig.* 1 & 2. S). This tissue, having an indented and irregular figure, is named by anatomists, corpus dentatum, ciliare, rhomboideum, or zig-zag. Other anatomists, considering this part as the point of union of all the white substance of the cerebellum, gave it the name *nucleus*. The cineritious substance, contained in this body, is a preparatory apparatus, destined by new fibres to increase the nervous

filaments which enter it: it is consequently a large point of increase for the cerebellum. Accordingly several new nervous bundles arise in it; continue their course; and ramify into branches, layers and multiplied subdivisions. At every point from which a principal branch goes off, is an increased quantity of grey substance. Thus is formed in this substance a number of fringes, or denticulations, equal to the number of the principal branches. The original bundle, the ganglion, the divisions and subdivisions are, as to their dimensions, in direct proportion to each other. The greater number of viviparous animals, having the cerebellum smaller than man, have also a smaller, and scarcely visible, ganglion (corpus ciliare). Hence anatomists thought that animals were destitute of it.

In man, one principal branch goes toward the middle line, and, with its fellow of the opposite side, contributes to form the fundamental portion of the cerebellum, namely, the vermiform process, which is ordinarily subdivided into seven principal branches (*Pl.* II. *fig*. 2. 62). The other branches, which go off from the corpus ciliare, are directed upward, downward and outward, and are expanded in slender layers horizontally disposed (*Pl.* I. *fig*. 2. I). Those of the middle line are longest; the others are shorter, the nearer they are to the place where the original cord enters the corpus ciliare. The nervous fibres of all the divisions and subdivisions are, at their peripheral extremity, covered with grey substance (*Pl.* II. *fig*. 2; *Pl.* III. *fig*. 1 & 2. 47—48).

If the cerebellum be cut vertically through the middle of this ganglion, we commonly find eleven principal branches; but the number of the divisions varies, according as the section is directed farther from or nearer to the middle of the cerebellum. The fibrous layers expanded into large branches and leaves, when vertically divided, present in their section a figure which, on account of its resemblance to the leaf of a thuya, or tree of life, bears the name, arbor vitæ. Horizontal or transverse sections, however, of these branches and leaves present only a white substance. Anatomists are therefore wrong in maintaining that the quantity of the cineritious mass is more considerable in the cerebellum than in the brain. The contrary will appear, if the brain be cut vertically, and the cerebellum horizontally.

BRAIN.

I shall now examine the organization of the brain. Immediately before their entrance into the pons Varolii, the pyramids are slightly contracted (*Pl.* I. *fig.* 1; & *Pl.* III. *fig.* 2. *c*); but as soon as they enter this mass, they are divided into many bundles, which spring out of the large mass of grey substance, contained in the pons Varolii (*Pl.* III. *fig.* 2. *f*). These longitudinal bundles are covered by a thick layer of transverse cords (*Pl.* III. *fig.* 1. *b*), which comes from the cerebellum, and which I shall describe hereafter. Some longitudinal bundles are disposed in layers; and others are interwoven with transverse cords. They ascend and are suc-

cessively enlarged, so as to form, at their exit forward and outward, at least two thirds of the crura cerebri. Thus the anterior and external bundles of the crura cerebri (*Pl.* III. *fig.* 1. *g*) are the continuation and gradual completion of the primitive pyramidal bundles. They contain internally, throughout their whole course, a great quantity of grey substance, from which they are continually increased by the junction of new fibres. At their upper extremity, where the optic nerve bends round their outer side, or at the exterior part of the corpora striata (*Pl.* III. *fig.* 1. 34—38), they receive the greatest additions. There exists a large mass of grey substance, wherein an infinite number of fibres are produced. Finally, at the external margin of the optic nerve, the nervous bundles of the crura cerebri assume a diverging direction, and form variously folded expansions, which are called the convolutions of the brain. In this way the pyramidal eminences, being successively increased and at last completely developed, form the inferior, anterior and exterior convolutions of the anterior and middle lobes (*Pl.* III. *fig.* 1).

It remains for me to show how are formed the posterior lobe and those convolutions which are at the superior margin of every hemisphere, or toward the middle line of the brain. The bundle which comes from the olivary tubercle (*Pl.* III. *fig.* 2. *a*), and some other posterior bundles (*Pl.* III. *fig.* 2. 70,) ascend, like the pyramids, through the transverse cords of the commissure of the cerebellum, or pons Varolii. In their ascent they receive addi-

tions, which are, however, less considerable than those of the pyramidal eminences; and they form the posterior and interior part of the crura cerebri. Here they receive the greatest additions from the thick mass of grey substance contained in the crura, which gives origin to many fibres, and forms a hard ganglion flat in the middle, and unequal at its superior and posterior sides (*Pl.* II. *fig.* 2. *p*). This ganglion has hitherto been known under the name, optic thalamus; but I have proved that the broad band of nervous fibres, which forms the optic nerve, is merely attached to the posterior external surface of this ganglion; that there is no proportion between the size of the thalamus and of the optic nerve, but that the thalamus is proportionate to the convolutions which arise from it; and that, by examining the interior of this ganglion, a great number of fine fibres is detected, which ascend divergingly, and at their exit, namely at the superior margin of this ganglion, form large bundles. The anterior bundles of the thalamus penetrate a large mass of grey substance, *viz.* that part of the corpora striata which is situated in the great cavities, and they receive from it a considerable addition. The bundles of this ganglion form the posterior lobes and the superior convolutions toward the mesial line of the head (*Pl.* III. *fig.* 2).

Thus we consider the thalami and corpora striata as apparatus of increase, in which many new fibres arise and join the others. In this way, the different cerebral parts are added to the other nervous systems, just as many branches might be engrafted upon the

stock of one tree.——So far I have described the diverging fibres of the cerebellum and brain; and I have followed these fibres from their origin to the bottom of the convolutions into which they enter. Before I speak, however, of the particular structure of the convolutions, I shall consider another order of fibres which come out of the convolutions, pass toward the middle line in the intervals of the fibres first described, and cross them, always converging, becoming thicker, and forming commissures or unions.

ON COMMISSURES.

All the nerves necessary to the manifestations of animal life are double; but each, in the middle line, unites with its fellow of the opposite side. Anatomists have long given the name—commissures, to different parts of the brain. They have mentioned the anterior, middle, posterior and great commissure. But they have never thought of the relation between these commissures and their respective parts of the brain: nor have they ever examined whence the commissures are derived; whether every cerebral part is united in the same manner; nor why these modes of union are so different in different kinds of animals. They had no knowledge of the law of this arrangement. We have, in this respect, established the strictest and most exact elucidation. We do not employ the expressions—anterior, middle, posterior, or great commissure: but endeavour to settle to what parts the junctions belong, and name every commissure according to the parts it serves to unite.

I have spoken of a transverse nervous layer at the bottom of the anterior fissure of the spinal marrow. By means of this layer, the two halves of the spinal marrow communicate with and act upon each other; and every part of one side participates in the state of the corresponding part of the other side.

COMMISSURES OF THE CEREBELLUM.

The double parts of the cerebellum are also united. In the cerebellum there exist nervous fibres, which are not in immediate connexion either with the original band, or with the apparatus of increase. These fibres come out of the grey substance at the surface, and pursue various directions through the diverging fibres, always converging toward the anterior external margin of the cerebellum, where they form a large and thick fibrous layer. The anterior ones still converging lie in front: the middle and posterior ones pass transversely through the longitudinal bands, which go to diverge in the hemispheres of the brain: all of them, in the middle line, unite with their fellows of the opposite side, and thereby join the two hemispheres of the cerebellum. Accordingly this part, commonly known under the name pons Varolii, or tuber annulare, is in reality the great commissure of the cerebellum. It is always in a direct proportion to the lateral parts of that organ. Therefore the mammalia, having smaller cerebella than man, have also

this commissure smaller. In man, who has a cerebellum so large, the commissure is particularly broad, and covers the origins of several nerves which are exposed in other animals. This commissure does not exist in fishes, reptiles and birds, because the cerebella of these animals have no lateral parts. All animals however have a commissure of the part which I have called fundamental portion, independent of the commissure of the lateral parts. This commissure is formed by those fine and soft fibrous layers which, arising from the superior and inferior parts of the fundamental portion, are commonly called the superior and inferior valves.

COMMISSURES OF THE BASIS OF THE BRAIN.

The uniting fibres of the inferior convolutions of the posterior lobe, and those of the posterior convolutions of the middle lobe, bend behind the crura of the brain, and behind the pretended optic thalami, passing from every side toward the middle line in an oblique direction, and are there joined together. The internal convolutions of the posterior lobe give off those uniting fibres, which are called the posterior fold of the corpus callosum; and the other uniting fibres of these convolutions form the fornix with its lyra or psalterium, which, according to anatomists, is composed of the lateral parts of its lower surface. The uniting fibres of the anterior convolutions of the middle lobe form the nervous cord which passes through the corpora striata without being adherent to their fibres, and the cord of

each side uniting, presents. in man, the figure of a bow, the convex part of which is directed forward. The direction of this bow is quite opposite in animals; in them its convex part is directed backward. Anatomists have called this cord commissura anterior (*Pl.* II. *fig.* 2. 61). The inferior convolutions of the anterior lobes have their commissures in what is called the anterior fold of the corpus callosum. The anterior and posterior folds of the corpus callosum are adapted to the cavities which extend between the inferior and superior convolutions of the posterior and anterior lobes.

COMMISSURES OF THE SUPERIOR CONVOLUTIONS OF THE BRAIN.

All the superior convolutions of both hemispheres of the brain have their uniting fibres in the great commissure, or in the corpus callosum (*Pl.* II. *fig.* 2. λ μ λ). This, like all other commissures, must be proportionate to the size of the parts from which it is produced. It is therefore much smaller in sheep, dogs, oxen, &c. than in man. As both hemispheres of the brain are separated both behind and before, the uniting fibres of the convolutions, which are thus separated, cannot join in a transverse direction. The uniting fibres of the posterior convolutions therefore run forward and inward, and those of the anterior convolutions run backward and inward. On this account also, the uniting fibres are most numerous at the anterior and posterior margins of the corpus callosum: and, as the posterior sepa-

ration of the hemispheres is more considerable than the anterior, so the posterior extremity of the corpus callosum is also thicker. In the middle region, however, of the corpus callosum, the direction of the uniting fibres is directly transverse.

Anatomists are wrong in maintaining that birds are destitute of a corpus callosum and of certain commissures. The cause of this error is the smallness of the commissures in birds. In them, however, the commissures are still proportionate to their respective parts; and the same principle exists in all animals. All double nervous parts are united, and the form, size, and direction of the uniting fibres alone offer any modification.

CONVOLUTIONS.

We have seen that the bundles of the corpora striata and thalami pursue every variety of direction, that is to say, toward the fore, the lateral, the back and the upper parts. At the bottom of the convolutions, the radiating or diverging and the converging filaments cross each other and form a tissue, from which however they are soon afterwards disengaged. Beyond this tissue, therefore, each duplicature may be easily separated into two layers (*Pl.* III. *fig.* 1. II. 1—2; 1—2): and as this may be done in all the convolutions, it follows, that if the tissue be destroyed by a rude kind of manipulation, or, as in hydrocephalus, extended by the gentle action of a gentle but constant and regular force, all the duplicatures will be transformed into a

kind of membranous expansion, externally covered by grey substance. Our knowledge of a person of fifty-four years of age, affected with hydrocephalus, first excited us to examine the structure of the brain in general, and of the convolutions in particular. It is a common opinion, that in hydrocephalic persons, the brain is disorganized or even annihilated. But this hydrocephalic patient still manifested, in a pretty high degree, those faculties which are dependant on the brain; and several similar examples are recorded. The conclusion that the brain is by no means destroyed in such hydrocephalic persons is therefore unavoidable.

Now in a large hydrocephalus, the upper convolutions do not appear: there is discovered only a membrane, of which the fibres are horizontal, while those of the convolutions possess, in the natural state, a position which is vertical from the basis to the top. It unavoidably follows, that by hydrocephalus the convolutions are separated into two parts. This is more probable, because the membrane of cerebral substance is very thin, and covered on the external surface with grey substance. Nay, it is possible to imitate the extension or unfolding of the convolutions, by taking away the arachnoid and vascular coats, by introducing the fingers into the great cavities, and by pressing against the convolutions. At first a little resistance is felt on account of the above mentioned tissue; but, beyond this tissue, the two layers of the convolutions are easily separated. This unfolding however of the convolutions has been very strongly contested. The French Institute have

stated, that their reporters found that the convolutions would separate into two lateral portions, as easily on one side of the middle line of each convolution, as in the middle line itself.

This is quite incorrect; and the contrary is easy of proof. Vertical slices of the convolutions, macerated in nitric acid diluted with rectified alcohol, or in pure alcohol, become hard, and are most easily divided at the middle line. The separation into two layers is also exhibited, when the convolutions are boiled for twelve or fifteen minutes in oil. When through a tube we blow on such a slice, or when, with a syringe, we direct against it a small stream of water, the separation may be made in the middle, very easily; but at the sides, not at all, without obviously destroying the structure of the fibres. In the two latter cases especially, the two surfaces which are separated remain smooth; nor is there any division of vessels, or any traces of fibres passing from one side to the other. The existence of the two layers of the convolutions must consequently be admitted. Nevertheless, it may be that between them there exists an adhesion of contiguity, maintained perhaps by a fine cellular membrane; but there is by no means a connexion of continuity, produced by an intermixture and confusion of substance. The junction of the two layers may be denominated agglutination, but not concretion.

INTERMEDIAL LAYERS OF THE COMMISSURES.

There are various objects which belong to the structure of the brain, of which the uses are un-

known. We have seen that the nerves of both sides are united; but it is not certain that the corresponding parts of both cerebral hemispheres are in immediate contiguity; for there is, in the middle line of all commissures, a layer of transverse fibres, accompanied by blood-vessels in the same direction. Bonhomme, Tarin, Vicq d'Azyr and Soemmerring have demonstrated this structure in the corpus callosum. I find that the direction of these intermedial fibres is always opposite to that of the fibres which seem to be separated by them. It is transverse, between the ascending bundles (*Pl.* II. *fig.* 2. 86, 87, 88, 90); in the midst of the corpus callosum, between its horizontal fibres, it is vertical (*Pl.* II. *fig.* 2. μ); and, in the anterior and posterior parts of the corpus callosum, it is divergent in radii. (λ, λ) These intermedial fibres produce what is called the raphe of the corpus callosum.

SEPTUM LUCIDUM.

The septum lucidum may be considered as the continuation and expansion of a fibrous bundle, resembling a band between the anterior and middle lobes (*Pl.* I. *fig.* 1. 63). It is in communication with the intermedial fibres of the corpus callosum (*Pl.* II. *fig.* 2. 57, 58, 59).

TRANSVERSE BANDS.

In plants there exist transverse layers of fibres wherever they are increased. This structure is

very evident in straw. There are found rings and transverse fibres, which however do not interrupt the communication of the superior and inferior parts. A similar arrangement is also observed in the structure of the brain. At every point of considerable increase exists a transverse band: as at the lower end of the corpora olivaria;—in the midst of the crura cerebri (*Pl.* III. *fig.* 1. 34);—at the external margin of the optic nerve (35);—between the thalami and striata (37); and at the external margin of the corpora striata (38).

CORPORA CANDICANTIA.

The corpora mămmillaria, or candicantia, are separated from each other in man (*Pl.* I. *fig.* 1. *Pl.* II. *fig.* 2. 16); in animals, they adhere, and seem to form only a single tubercle. Each corpus mammillare contains three cords, of which two are internal and one external. The external cord is joined to the transverse band under the optic nerve; the internal anterior is in connexion with the anterior crus of the fornix; and the internal posterior sinks into the interior of the thalamus, and is there united to another transverse band.

PINEAL GLAND.

The pineal gland (*Pl.* II. *fig.* 2. E.) bears a name which is acknowledgedly inaccurate. It is not a gland, but composed of grey and white substance.

Four nervous threads are produced in it. Its name pineal has been derived from its mechanical form, which somewhat resembles a cone of the pine or fir.

CAVITIES OF THE BRAIN.

The cerebral parts are separated from each other at various places. These separations are called ventricles. Anatomists therefore speak of five ventricles; but the fifth has no analogy to the others. It consists in the separation between the two layers of the septum lucidum. In this view every anfractuosity, the interval between the two hemispheres, and that between the anterior and middle lobe, would as well deserve the name of ventricles. The four greater cavities are in communication with each other; and therefore they cannot be considered as separate cavities. We neglect the numerical order commonly applied to them, as first, second, third and fourth, and name them according to their situation. The fourth ventricle of anatomists is the separation of the cerebellum and the valvula Vieussenii from the medulla oblongata (*Pl.* II. *fig.* 2. *m m*). By means of the canal before and under the fourfold tubercles, called the aqueduct of Sylvius (*Pl.* II. *fig.* 2. φ), it communicates with the third ventricle, or the separation between the thalami (M M). The lateral or great cavities are in the interior of the hemispheres forward, backward, and in the middle lobe: they are consequently in the interior of the lobes. They are in communication

with the third ventricle by the separation between the fornix and thalami.*

* Dr. Baillie, in the fourth edition of his excellent work on Morbid Anatomy of the Human Body, London, 1812, p. 448, in a note, says, " A distinguished author has, in a late publication, insisted very strongly upon the existence of an immediate communication between the two lateral ventricles of the brain, and has expressed great surprise that it has been denied by several teachers of anatomy in London. Without entering into any dispute about this matter, which in itself is of no importance, I shall briefly mention what appears to me to be the real state of the circumstances. The fornix, at its anterior extremity, lies loose upon a part of the thalami nervorum opticorum, and there is a small chink on each side of the fornix leading obliquely downwards from the lateral ventricles to the anterior extremity of the third ventricle. While the fornix is allowed to remain in its natural situation, there seems to me to be no immediate communication between the lateral ventricles. But when the fornix is elevated, which may be very easily done, then the lateral ventricles communicate directly with each other, and the communication is more or less according to the degree of the elevation. It may be said, that the lateral ventricles still communicate together by means of the third ventricle. This however is not properly an immediate communication between the two lateral ventricles, unless any two cavities, which communicate with a third, may be properly said to communicate directly or immediately with each other."

As Dr Baillie is disinclined to dispute about this matter, he might, without injury to his statement, have omitted the reasoning into which he enters at the end of his note, where he says that two cavities communicating with a third cannot be properly said to communicate directly or immediately with each other. The essential point to be considered is the communication of the lateral ventricles with each other. I shall, however, state how far we agree with Dr. Baillie, and in what respect I consider his statement as incorrect.

In the first volume of our large work on Anatomy and Physiology of the brain, published at Paris, 1810, we have mentioned

COMMUNICATIONS.

Besides the separate and independent origin of every nervous part, and the commissures or junctions

that the lateral ventricles are in communication, as soon as the fornix is elevated. For this reason, we have stated, that a small quantity of fluid may indeed be accumulated on one side; but that the opinion of certain authors, according to which there are large hydrocephali on one side, seems to us without foundation in observation, and incompatible with the structure of the brain.

Dr. Baillie says that he mentions what appears to him. I well know, that in many things we must be satisfied with appearance; but on this point of anatomy I speak in a positive way, because the real structure can be shown in every head of man and animals. The fornix, *in its whole extent*, is separated from the pretended optic thalami. Dr. Baillie then is, with many other anatomists, mistaken in stating, "that the fornix at its anterior extremity lies loose upon a part of the thalami nervorum opticorum, and that there is a small chink on each side of the fornix leading obliquely downwards from the lateral ventricles to the anterior extremity of the third ventricle." This opinion is also in contradiction with the other assertion that "the fornix is easily elevated." This indeed would be impossible without a separation between the fornix and thalami.

The fornix does not lie loose merely at its anterior extremity: its separation is much more considerable, and may be easily demonstrated as we have represented it in our large work. There, a great part of this separation is visible in *Pl.* XIV. and XVII. between γ, 59, 60 and 73; and its continuation is shown *Pl.* XV. from 73 to 72 and 70.

The general statement in the text also, that, "when the quantity of water is very considerable, the fornix is raised, at its anterior extremity, in consequence of its accumulation," is incorrect. This is the case only when the water is collected in the anterior cornua: but when the accumulation of water begins in the lateral and posterior lobes, the posterior part of the fornix is sooner elevated than the anterior part.

of all those nervous parts which are double; there is to be considered yet another nervous apparatus,

There is still another observation of Dr. Baillie to which I cannot agree. He says, that this matter in itself is of no great importance. I think knowledge and truth are always more important than ignorance and error; and in anatomy the structure of any part cannot be indifferent. I prefer, for instance, to *know* that between the fornix throughout its whole extent, and the pretended optic thalami, for above three inches, there is a perfect separation; rather than to be satisfied with the *appearance* that only a small chink separates the fornix at its anterior extremity from the optic thalamus.

In order to show that it is really important to be acquainted with the structure of this part of the brain; that it is worth while to determine it; and that it is not sufficient to state what it appears to be, I shall quote a fact, as it has been lately published in the Philosophical Transactions for the year 1814, Part II. p. 473, read to the Royal Society by Sir Everard Home.

" In a boy the enlargement of the head was perceived at three months, and increased for three years, and then appeared to be stationary, and the child till that period was sensible. The upper part of the skull from that time began to ossify, and in three years more there was only an irregular space of the os frontis remaining open. The child continued sensible till three years old, and then became gradually less so, did not know what he did, heard sounds, but could not see. At six years old he died. The child was three feet three inches high: the skull twenty seven inches round: the water, contained in the two lateral and third ventricles, was six ale pints and a half in quantity. The cerebrum formed a thin case of medullary substance, surrounding this cavity. The cerebellum was entire." In a note Sir Everard Home adds, " The lining of the lateral ventricles was tough: the septum lucidum elongated, so that the corpus callosum was raised up close to the skull, the falx of the dura mater being nearly obliterated. The water in the third ventricle had split the fornix and septum lucidum into two, and the thin membranes of the septum had holes in them, making a communication between the third and lateral ventricles. The substance of the brain surrounding those cavities, as well as the

which I call communicating branches, or nervous apparatus of communication. By their means,

pia mater covering it, had no convolutions, there was a continued smooth surface. On the right side, upon which the child was usually laid, there were no remains of medullary or cortical substance; and there the pia mater and dura mater adhered together. There was no remaining brain between the third ventricle and sella turcica. On the left side of the left hemisphere, the medullary and cortical substance was only half an inch thick. The corpora striata and thalami nervorum opticorum were small and tough; the union between the thalami was elongated into a broad flat ligament. The two commissures and iter ad infundibulum had the natural appearance. The olfactory nerves were tough and small; the optic nerves had no medullary pulp; the other nerves going out of the skull had undergone no change."

I should indeed never have believed that such statements could be made, unless I had actually seen them in a printed work. I do declare, that *such things* as are here stated could only *appear* so: they are in absolute contradiction to nature and to reason. To him who really knows any thing of the structure of the brain, it would be quite sufficient to quote them. As however I write also for other readers, who may be desirous to become acquainted with the structure of that organ, I shall establish my assertion. First then, anatomically speaking, it is quite impossible that the two commissures and the iter ad infundibulum should have had the natural appearance, and that at the same time there should be no remaining brain between the third ventricle and sella turcica. Those who have our large work may consult *Pl.* XI. and those who possess the opportunity may examine nature itself in order to be convinced how erroneous such statements are. *Pl.* XI. 61 is the anterior commissure; 44 the posterior; and 22 the infundibulum: this latter part is situated immediately on the sella turcica. In this case, moreover, the cerebellum was entire. Now considering that the space between 22, 61 and 44, as well as the whole cerebellum, was entire; and the statement, that at the same time there was no brain between the sella turcica (the bony mass below 22 and 32) and the third ventricle (M M), it is evident that those alone will believe

particular nervous parts are brought into communication, and thereby placed under mutual influence.

this who place credit in assertions in the direct ratio of their impossibility.

"On the right side, upon which the child was usually laid, there were no remains of medullary or cortical substance, and there the pia mater and dura mater adhered together." I will not ask, how Sir Everard Home accounts for the want of cerebral substance on the right side, while there yet existed the pia mater, which however is composed of the blood-vessels of the brain &c.—The corpus callosum, the fornix and the two commissures, however, could not possibly exist without brain on the right side, because at least one half of these parts originates from the lateral mass of the brain.

"The water in the third ventricle had split the fornix and septum lucidum into two, and the thin membranes of the septum had holes in them, making a communication between the third and lateral ventricles." This is also quite impossible. The fornix, in the middle line, is adherent to the corpus callosum, and not to the pretended optic thalami between which the third ventricle is formed. Hence if water be collected in the third ventricle, and elevate the corpus callosum, the fornix must follow it; and if the fornix was really split, I declare that this circumstance must have been the effect of a violent mode of procedure. Of this I am well convinced from my own observation; and I confidently refer the point to the future statements of accurate anatomists. At all events, this paragraph shows, that practitioners in general do not yet sufficiently know, how, in hydrocephalic heads, the communication between the lateral ventricles is established.

The reasoning on this observation by Sir Everard Home is still less satisfactory. A summary of the case may be sufficient. "Six pints and a half of water were contained in the two lateral and third ventricles; the *cerebrum* formed a thin case of medullary substance surrounding this cavity; the substance of the *brain surrounding* those cavities, as well as the pia mater covering it, had no convolutions; there was a *continued* smooth surface; the lining of the lateral ventricles was tough;—and————on the right side there were *no* remains of *medullary* or *cortical substance!* and on the left side

Thus, in the lower classes of animals, the different ganglia are joined to each other by particular nervous cords. In the higher classes of animals, it is the same with the various ganglia and plexus of the nerves of the abdomen and thorax. These nervous systems communicate with every pair of the spinal nerves, with those of the five senses, and with the cerebral parts. The various pairs of spinal nerves also adhere one to another; and they are all concatenated by a longitudinal cord, visible at the bottom of the posterior fissure, throughout the whole length of the spinal marrow. The nerves necessary to motion, likewise, are brought into communication with the nerves of the five senses; and both these kinds, with the cerebral parts. This communication of various nervous parts always corresponds precisely with their mutual influence. Thus the five senses and all the cerebral parts are in

they were half an inch thick." Are the existence of lateral ventricles, a thin case of brain, brain half an inch thick, and no brain at all synonimous terms, since they are here employed to designate the same general fact?!!!

Far be it from me to doubt the general accuracy of observations which characterizes the statements recorded in the transactions of a society which the immortal names of so many accurate observers and profound philosophers have rendered for ever illustrious. As accuracy and precision are the essential basis of any observer, I will *not* believe that such is the general inaccuracy even of Sir Everard Home's observations: I suppose that it is only in this particular case that Sir Everard Home can possibly have committed any oversight of the kind, since, I have no doubt, he has paid no *great* attention to the brain and nervous system. And although the statement which he has here made does involve a few contradictions, yet the thing *appeared* so to him.

communication with the nerves necessary to motion. The five senses communicate also with certain cerebral parts more than with others: the nerve, for instance, of taste is in nearest communication with the nerves of mastication, deglutition and respiration. The auditory nerve is in more intimate connexion with the nerves of hunger and thirst, of the voice and of taste, and with the organs of propensities and sentiments, than it is with the organs of the intellectual faculties. The optic nerve, on the contrary, has the most intimate communication with the organs of the intellectual faculties. Finally, while all the cerebral parts adhere to each other, certain parts are connected more intimately than others. These considerations will be better understood, when the different faculties of the mind are explained, and their respective organs are demonstrated. They are then of the greatest necessity in order to elucidate the mutual influence of the various faculties.*

RECAPITULATION.

In this chapter, I have developed our method of examining the structure of the nervous system; I have demonstrated the necessity of admitting as many origins as there are various nervous masses; and I have pointed out the proportion of the grey and

* Those who make a study of anatomy, and who desire farther details, will find them in the first volume of our large work, entitled, "Anatomie et Physiologie du Systême Nerveux en général et du Cerveau en particulier." There they will find also every particularity exhibited, by plates of the natural size.

white substance in the nervous system, as well as their relation. I have, moreover, considered the differing structure of the nervous parts of the abdomen and thorax, of the spine, of the five senses, of the cerebellum and the brain; I have established the general principle of commissures or unions of all nervous parts which are double; and I have proved the communication of the various nervous parts with each other, and especially of those which exert upon each other the greatest influence. It follows that all nervous parts are formed and perfected in the same manner; that our considerations are general and simple; and that this conformity of all these established principles bears the character of truth.

PART II.

PHYSIOLOGY OF ANIMAL LIFE.

THE second part of our inquiries is physiological. It considers all the manisfestations of the human mind, or all the functions of the man which take place with consciousness, that is, animal life. These functions may be divided into external and internal. The former consist of voluntary motion and the functions of the five senses; the latter comprise the functions of the brain.

CHAPTER I.

FUNCTIONS OF THE FIVE SENSES.

THE external senses permit to men and animals a communication with the beings around them: it is by the medium of the senses, that they acquire a determinate consciousness of the external world. Without these senses, men and animals would have only an *internal* existence; but not, as Richerand says, a mere *vegetative* existence. What then can interest man more than his senses, to which he owes so many sensations, so many enjoyments? Hence the assiduous investigations of this subject by philosophers, physiologists and anatomists. Yet, not

only the structure of the five senses, but also their functions, are far from being perfectly and precisely determined. A great number of whimsical, extravagant and contradictory opinions relative to the senses may be mentioned.

I do not remember, that the *moral* sentiments have ever been derived from the external senses: it is consequently unnecessary to prove that such an assertion would be erroneous. This, however, is not the case with respect to the *intellectual* faculties. According to many ancient philosophers, all ideas are innate, and only excited by the external senses. Since the times of Bacon and Locke, however, the greater number of philosophical systems rest upon the axiom of Aristotle: that all ideas come into the mind by means of the external senses. According to this principle, the perfection of the manifestations of the intellectual faculties depends on the perfection of the external senses. Now if the ideas and sensations of man and animals are either produced or excited, solely or especially, by the five senses, man and animals ought to manifest themselves according to external objects and accidental impressions. Their faculties ought to be proportionate to the perfection of the five senses, and to the education bestowed on them; and it ought to be possible to change and modify each individual at pleasure. Daily experience contradicts this hypothesis.

Philosophers of another class maintain that the mind acts independently of all organization, and that the senses are rather an impediment to, than instruments of, action. They complain much of

the illusions of the five senses; and they despise all testimony and all conclusions grounded upon sensation. According to them that only is truth, which may be conceived by the understanding alone. If the influence of all external objects, of all social institution, of education in general be denied, this opinion is evidently in contradiction with the history of all times and of every individual. If all truth resulted from reflection alone, it would be easy to establish general laws, and it would be unnecessary painfully to collect a great number of facts and experiments in order to deduce from them general principles. But history proves the insufficiency of reflection alone, that is, unguided by experiment.

Finally, still other philosophers admit two sources of the manifestations of the intellectual faculties, an external and an internal; and they consider the manifestations of the intellectual faculties as dependant on one or other of these sources.

Those who compare this chapter with that which we have published on the five senses, in the first volume of our large work, will find not only a new arrangement of the considerations respecting them, but also several corrections and many additional elucidations. I shall here first show, that many faculties attributed to the external senses cannot be considered as their effect, and I shall then examine the special functions of each external sense. Before, however, I consider each sense in particular, I shall enter into some general considerations relative to all the senses.

Generalities as to the Five External Senses.

I. DOUBLENESS OF THE ORGANS.

The organs of every sense are double, as the organs of animal life in general. There are two eyes, two ears, and two nerves of smell, of taste and of feeling. Some authors have denied the doubleness of the cerebral organs; but the denial was founded on their mistaking their doubleness for their symmetry. It is true that both organs are seldom symmetrical; but is not this the case with both eyes, both ears, and with other double parts? Thus the want of symmetry does not annihilate their doubleness. Indeed the nerves are commonly larger on one side than on the other; and it may be asked on what side they are commonly largest? In the greatest number of persons the right side of the whole body is stronger than the left. In respect to the hands and feet this is acknowledged; and it is commonly maintained, that this is the case on account of the continual exercise of the right hand. But, it may be rejoined, Why is the greatest number of new-born children right-handed? For of ten children, there are perhaps seven right-handed from birth, who take or hold with the right hand without being taught; and the three others, whose right hand is exercised from infancy, feel nevertheless more strength on the left side. This is also the case in all climates and in all nations. Moreover, if the strength of the right hand be the mere result of

exercise, why is all the rest of the right side stronger than the left? Why is the right eye larger than the left? Why are, on the right side, the breast and even the cerebral parts larger than on the left? The greater number of diseases attack the left side much more frequently than the right. The greater number of hump-backed persons have this deformity on the right side, because the muscles of the right side are stronger, and draw the spinal vertebræ on this side. Thus the organs of animal life are double, while the organs of automatic life are mostly single; and the organs of the right side are commonly stronger than those of the left.

II. THE CONSCIOUSNESS OF EVERY SENSE IS SINGLE.

Another general consideration as to the five senses is, that, while each has two sentient apparatus, and while their impressions are accordingly double, yet the consciousness of both impressions is single. Various explanations have been given of this phenomenon; and the sense of sight has generally been the point considered by those who endeavoured to explain it.

Touch.

Many writers explain single consciousness by the sense of touch. At the beginning, they say, vision is double, but touch rectifies this error. Buffon was of this opinion. He supported his assertion by the following experiment: If we look with both eyes at two objects in the same direction with ourselves,

and if we fix the eyes upon the nearest object, we see it single, but at the same time we see the farthest object double: if, on the contrary, we fix our eyes upon the farthest object we see it single, and the nearest object double. This experiment is, according to Buffon, an evident proof that we see objects double, but judge them single, by the rectification of touch. As, however, in this experiment the same object now appears double, then single, how is it possible to infer from it that touch has corrected sight? Why is this correction only relative now to the nearest, then to the farthest object? It seems to me that a conclusion altogether different may be drawn from this experiment; namely, that sight has no relation to touch: sight, its modifications and its illusions, are only the result of the organization and position of the eyes, and of the laws of the refraction of light.

Moreover, no one recollects ever having seen objects double during infancy. No person born blind, and having recovered sight by the operation for cataract, has on that occasion seen objects double. Neither have we ever observed, or heard, that animals take single objects for double ones. The butterfly does not confound the flower with its image, and the lamb distinguishes very well its mother from her shadow. Even animals which live only a short time, and which never can rectify their vision by touch, are not deceived by the multiplicity of objects. Sometimes, moreover, in morbid affections of the eyes, and in squinting, man sees double, notwithstanding all his preceding experience.

It is consequently evident that the cause of single vision is not to be found in the sense of touch.

Corresponding Points.

Others explain single vision in another manner. If, they say, the image of any object fall upon corresponding points of the retina, that is, upon points which at the same time are correspondingly affected, the object appears single; but if the images fall upon different parts of the retina, which in general are not at the same time correspondingly affected, the object appears double. This explanation is very common: Cuvier and Richerand admit it. It is rare, however, that corresponding parts of the eyes are at the same time correspondingly affected.

Inequality of the Eyes.

Several authors maintain that the inequality of the eyes is the cause of the single consciousness of sight. According to them the strongest impression alone is perceived. It is, indeed, true that very few persons have both eyes equally strong, and consequently the impressions in respect to energy do not produce the same effect in both eyes. But if only one impression be perceived, why do we see better with both eyes, and hear better with both ears?

Decussation of the Optic Nerves.

Ackermann explains single vision by the decussation of the optic nerves. Such an arrangement cannot, however, be demonstrated in respect to the auditory nerves. And it is beyond doubt, that the single consciousness of sight, hearing, smell and taste, must be explained in the same manner.

Active State.

Gall ventured to give another explanation. He distinguished two states of the five senses; calling one active and the other passive. The functions are passive if they take place independent of the will. We must, for instance, perceive the impressions of light which fall upon the retina, or the impressions of sound which agitate the auditory nerve. Gall says, we perceive *passively* with both organs, we see with both eyes, hear with both ears; but the active state of the functions of the five external senses takes place only in one organ, and commonly in the strongest. We, at the same time, see with both eyes, but we look with one eye alone; we hear with both ears, but we listen only with one; we feel with both hands, and we touch only with one, &c.

There is no doubt that we look with one eye only. If we place a small rod, a pencil, a goose-quill or any other slender body between our eyes and a light; if we keep both eyes open, and trace the right line between our eyes, the stick and the

light; and if we then look with both eyes the stick should occupy the diagonal, and its shadow should fall on the nose. But the shadow falls always on one eye, on that of which the person, who repeats the experiment, ordinarily makes use in looking with attention. If the person keep the slender object in the same position, and shut the eye with which he did not look, the direction to him remains the same; but if he shut the eye with which he looked, the slender body appears removed far from its former direction. Again; let any one look at a point at a little distance from his eyes; both eyes seem to be in the same direction toward the object. Then let him shut his eyes alternately. If he shut the eye with which he did not look, the other stands without the least motion; but if he shut the eye with which he looked, the other eye immediately makes a slight motion inward in order to fix the point. Moreover, in many animals the eyes are placed altogether laterally, and cannot be directed at the same time toward the same object. Finally, even the gestures of man and animals prove that they look with one eye, and listen with one ear; for they direct one eye or one ear toward the object to be seen or heard.

To this Walter and Ackermann have objected an experiment which has been invented, believed and repeated according to an erroneous supposition. It is known that green is composed of yellow and blue. From this they inferred that, if we look through spectacles of which one glass is blue and the other yellow, we perceive the mixed colour, green. We

have often repeated this experiment, but never with any such result. If we thus behold green coloured objects, as meadows, we see them green; for the coloured glasses do not destroy this colour. If we behold other objects, and both glasses of the spectacles are equally thick, we perceive the colour of that glass, which is before that eye with which we look. If the glasses be of different thickness, we perceive the colour of the thinnest glass.

It may be asked, with which eye men ordinarily look? Le Cat thought that the eyes change every day. Borelli maintained that the left eye is the strongest; but Le Cat asserted that sometimes the right, sometimes the left eye shows the greatest energy. We have observed that as in general the whole right side and the right eye in particular are stronger, so the greater number of persons look with the right eye. It is, however, to be observed that every one does not look with his strongest eye.

After all it seems to me that even this explanation is not satisfactory. Indeed it is very remarkable that passively we perceive, at the same time, the impressions of both organs of any sense, not only if one object impress both eyes or ears, &c.; but also if different objects impress both of them. Even different impressions of different objects may be perceived by both organs of different senses. We may for instance, see with both eyes different objects, and, at the same time, hear different sounds with both ears; but as soon as we are attentive; as soon as we look or listen, we perceive at the same time only one impression. It is impossible at the

same time to attend to two different discourses. A musician, who directs the orchestra, hears passively; and he cannot at the same time be attentive to different instruments. The rapidity of mental action deceives many persons, and makes them think that it is possible at the same moment to pay attention to different objects. It follows that there is a difference between the active and passive state of the five external senses. But it is another question, whether this difference explains the single consciousness of every sense? I think it does not.

First, this explanation would be applicable only to the active state of functions, and not at all to their passive state. The cause, however, of single consciousness must be the same for both states of the functions. It must, moreover, be considered that the active state is not at all produced by the external senses themselves, any more than voluntary motion is the effect of the muscles themselves. Some internal power excites the active state of the five senses. The five senses are in themselves always passive, and only propagate the external impressions; and they appear active only when some internal cause employs them to receive impressions and to transmit them to the brain. It is therefore probable that the same internal cause which puts only a single organ of the five senses in action is also the cause of the single consciousness of different impressions. Thus, the explanation given by Gall of single consciousness, according to the active and passive state of the five senses, is not

only grounded upon an inaccurate notion, but is also far from being satisfactory, even if the supposition were true.

Commissures.

Still another explanation may be founded on the commissures or uniting fibres of both organs. For though the constituent parts of every organ are double, all similar parts of both sides are united in the middle line by commissural apparatus. It is possible that the impressions of both organs may be combined by this arrangement. This would explain the single consciousness of both organs of any given sense; but it does not explain the single consciousness of the impressions received by different senses.

Central Point.

Many philosophers and physiologists speak of a central point at which all nerves terminate. The anatomy of the brain, however, proves evidently that such a central point is quite impossible. If, moreover, all impressions arrived at the same point at the same time, they would produce the greatest confusion, as Van Swieten and Tiedemann have already observed. Thus, from what I have said of the various explanations of single consciousness, it follows that we are not yet acquainted with its true cause.

III. EVERY SENSE HAS ITS OWN NATURE.

A third general consideration as to the five senses is, that each performs its functions by its own peculiar power. Much has been said of the mutual rectification of the five senses and of their habits. It is, however, a general principle that the power of every sense is innate and inherent in the sense itself. The relations of every sense to external impressions are determinate, and subjected to positive laws. As soon as any odour makes an impression upon the olfactory nerve, this impression is found to be either conformable and agreeable to the smell or to be otherwise; and according to this relation between the external impressions and the senses, the manner of acting of man and animals is different. No preceding exercise or habit is necessary in order to acquire the special power of every sense: the functions of every sense depend only on its peculiar organization. If this be perfect, the functions are perfect also, and if the organization be diseased, the functions are deranged notwithstanding all preceding exercise. If the optic apparatus be perfect in new hatched birds, their sight is perfect; for instance, in chickens, ducks, partridges and quails: on the contrary, if in new-born animals the organization of their eyes and ears be imperfect, their seeing and hearing powers manifest themselves with corresponding imperfection. If in adult persons the eyes be diseased, the vision is deranged. In old persons, the functions of the five senses lose

their energy, because the vital power of the organs decreases.

It is indeed ridiculous to suppose that nature should have produced any sense, which could not perform its functions without being supported by another and a different sense; if, for example, we could not see without feeling, or if we could not hear without seeing. We must, however, enter into this consideration: that no sense acquires its faculty by any other sense; that every sense cannot produce the same sensations; that different senses may distinguish other beings; and that one sense is more fit than another to make us acquainted with different bodies and their qualities. The laws of sight are determinate, and a straight rod plunged in water appears crooked, because we see according to the laws of the refraction of light. Touch however proves that the rod is straight. This is a kind of rectification; but this kind of rectification must not be confounded with the idea according to which one sense acquires its faculty by the rectification of another sense: touch may show that a rod which is plunged in water, and looks crooked, is straight; but the eyes will always see it crooked. This rectification of the senses is mutual, but not the prerogative of one sense. In this view, the eyes may rectify the sense of touch. If, without knowing it, a thin paper may be placed between two of our fingers, for instance, between the thumb and forefinger, we may not feel it, but we may see it. Even smell and taste may rectify the senses of seeing and of touching. Thus many fluids look like water,

and it would be impossible to distinguish them by the sense of touch; but it is easy to do so by smell and taste. Thus every sense has its peculiar and independent faculty; and its manifestations are subject to constant laws, and depend on its respective organization; but every sense also perceives impressions of which another is not susceptible; and in this respect it is that the external senses rectify each other.

IV. EVERY SENSE MAY BE EXERCISED.

It is also a general observation that, while no sense acquires its faculty by exercise, yet the functions of every sense are strengthened by exercise. The sense of feeling, if it be exercised, may acquire a very high degree of perfection. Thus blind persons feel the proximity of external objects by the impression of the air upon their faces. Le Cat speaks of a blind-born person of Poiseaux, who accurately distinguished the distance of the fire by the degree of its heat. Saunderson, though blind, in handling a series of medals, discerned the false from the true more exactly than many connoisseurs. Le Cat mentions a sculptor, Ganibasius of Volterra, who, being blind, traced the living face with his fingers, and modelled it in potter's clay. The deaf and dumb, in the Institution of Mr. Eschke, at Berlin, read with facility what was written on their back, though covered with clothes. Boyle and others relate that the touch of blind persons was so acute, that they even distinguished different colours and

their shades. The same thing is told of the blind Weissenbourg, of Manheim: this man had about thirty pieces of cloth, and he indicated with precision the colour of every piece; but he was often mistaken in determining the colour of the clothes of strangers. The cards, however, with which he played were pricked with needles, and consequently marked; yet those who were not acquainted with it thought that he distinguished the colours of the cards by touch. Many other blind persons have assured us that it is impossible for them to discern colours. A few, however, discern white from black, because the surface of the white colour is more smooth. In general, if blind persons distinguish colours, they feel only a more or less smooth surface: but do not acquire any idea of colour itself.

The sense of taste is strengthened by exercise, as well as every other sense. At first, certain dishes even appear tasteless or unpleasant—for instance, oysters, or truffles; but, after having eaten of them several times, we distinguish their particular savour. It is a common opinion that the sensibility of taste is early in life blunted by spicy dishes, and by all those refinements of luxury which are daily invented: but is it possible to maintain that our cooks and epicures have a taste more obtuse than those savages, who distinguish the flavour of some roots which are insipid to us? Do not the frequent poisonings by vegetables, as by hemlock, bella donna, or poisonous mushrooms, prove that the taste of the sober country-man is not a surer guide

to salubrity than the taste of the voluptuous citizen? We must, however, admit in respect to the sense of taste what happens in respect to every other sense—if impressions upon it be too strong its sensibility is blunted. The functions grow more energetic only by a conformable exercise.

The sense of smell is also susceptible of exercise. Several physicians, in the passage to a room, distinguish the kind and state of certain diseases. It is related that some negroes follow other persons by their track as dogs do, and discern the traces of a negro from those of a European. In the same way, the smell is blunted by the use of too strong and penetrating odours; but a conformable exercise strengthens its functions.

The sense of hearing is, like the other senses, improved by exercise. The blind Weissenbourg, of Manheim, judged exactly of the distance and size of persons who in an erect posture spoke to him. The blind Schoenberger, of Weide, in the Upper Palatinate, had the sense of hearing so acute, that it was sufficient to indicate, by striking, the place where the nine pins were put up, or the mark to be shot at, and he often hit the aim. Blind persons often find the pin or piece of money which makes a noise in falling.

Finally, the eyes acquire by exercise a very high degree of activity. Le Cat mentions a deaf woman of Amiens, who distinguished what other persons said from the motion of their lips. In order to tell her any thing it was sufficient for others to move the lips as if they were speaking. If foreigners spoke a

strange language, she discovered it immediately. We observed a similar phenomenon at Berlin, and elsewhere, in several deaf and dumb persons. They distinguished by the motions of our lips what we told them: several understood us even when we kept the hand before the mouth, the motions of the face in general being sufficient: and they read with facility what was traced in the air with the fingers. It follows, that though exercise does not produce the faculties of the five external senses, yet the functions of every sense grow more energetic by exercise.

V. MODIFICATIONS OF THE FIVE SENSES.

A fifth general consideration as to the external senses is, that their functions are modified not only in different kinds of animals, but even in different individuals of the same kind. The taste and smell of carnivorous and herbivorous animals undoubtedly differ. The horse and ox find hay to be savoury, while the dog and wolf find flesh to be well tasted. The senses change also at different ages, and according to peculiar habits: they even participate in the different states of the health. In this manner are to be explained the various longings of pregnant women, of hypochondriacal and of hysteric persons. This explains also why we are sometimes disgusted at what we formerly liked. Moreover, several substances, inodorous to man, make a strong impression on the smell of certain animals. Some animals are also much excited by certain

odours, to which others are quite indifferent. One odour is agreeable to one individual, and repugnant to another. In the same way, the eyes and ears must be differently modified in those animals which live under water, from what it is in those which inhabit the air: the eyes are even different in those animals which see in the night from what they are in those which see during the day. One individual likes a colour or a sound with which another is displeased. Therefore, it is certain that the functions of the external senses are modified, not only in different kinds of animals, but even in different individuals of the same kind.

VI. THE EXTERNAL SENSES DO NOT PRODUCE THEIR ENJOYMENTS.

The five external senses are adapted only to perceive the impressions which are given——they are agreeably or disagreeably affected by them: but they cannot produce their own enjoyments. Animals are confined to the use of those impressions which are presented to them: they prefer the taste of one thing to another; they prefer particular odours, colours and sounds to others; but they cannot, at will, command the more agreeable impressions. Man alone is capable of this: man alone, in order to enjoy smell, cultivates gardens and constructs manufactories of perfume; he alone plants flowers in order to gratify both smell and vision. Man however, has not conceived these ideas by means of smell; for this sense is much stronger and more acute in the ox, horse and dog, which do not cul-

tivate flower-gardens, and which have no rose-water. In the same way animals have no cookery; and they cannot voluntarily charm either their eyes or their ears. We shall afterwards see that man possesses these advantages in consequence of certain superior faculties which produce these enjoyments, while the external senses only perceive them.

VII. IMMEDIATE AND MEDIATE FUNCTIONS.

Still another general consideration as to the external senses relates to the nature of their functions. These are immediate or mediate; that is, every external sense perceives one particular kind of impression, and excites, by means of its organization, only one kind of sensation. This peculiar sensation is then the immediate function of each particular sense. The external senses are also intermedia for the action of the internal faculties; and all those functions of the external senses, which are necessary to the accomplishment of the functions of the internal faculties, are *mediate*. The immediate perceptions depend wholly on the external senses; but in the mediate functions the five senses are only auxiliary, and merely contribute to the acquisition of determinate ideas, which are conceived by internal faculties.

VIII. EVERY SENSE HAS ONLY ONE KIND OF PERCEPTION.

Finally, it is certain that every sense produces only one kind of function. I cannot too often repeat this axiom, that no organ can manifest two

kinds of function, or that two kinds of perception never take place in one organ. Therefore, as soon as we observe that the same conception may be manifested by several senses, we may be certain that the conception belongs to some internal faculty, which makes use of various external intermedia in order to act upon the external world. The conception of form for instance, is performed by an internal faculty, but this internal faculty may examine particular forms by means of touch or of sight. After having considered the generalities of the five senses, let us consider their particularities.

ON THE PARTICULARITIES OF THE FIVE EXTERNAL SENSES.

The external senses destined to bring man and animals into communication with the external world may be divided into two sorts. By means of two of the senses we are acquainted with external bodies, when they immediately touch the sentient organs. This is the case with touch and taste. The other senses perceive remoter bodies. I do not say, that perception or sensation can take place in any sense which is not affected by some immediate impression: this is an indispensable condition; but it is certainly one thing to say, we are acquainted with remote bodies and their qualities, and another to say that we perceive, without impression. This latter phrase would be contradictory and absurd. We perceive remote bodies either by some particles which are detached from them, and carried to our

sentient organ, as to the olfactory nerve, or we perceive them by some intermedia, as by light and air. In both cases, it is certain that man and animals become acquainted with remote bodies and their qualities.

In general only five external senses are spoken of: but it is necessary to speak with greater precision. I, therefore, first separate the general expression "sensation" from the determinate sensation of hunger and thirst; from voluntary motion to which voice belongs; and from the sense of feeling; as well as from touch. I consider the word sensation as an expression altogether general. Every act of consciousness or every perception of any impression, whether external or internal, is sensation. Hunger and thirst however constitute a particular class of sensations, attached to particular nerves; and voluntary motion ought not to be confounded with the sense of touch as is generally done. It seems to me also that the nerves of motion and feeling are quite different; and in the descriptive anatomical part, I have already mentioned the reasons which induce me to think so. Finally, touch must be distinguished from feeling. Touch is the effect of an internal faculty, which makes use of the nerves of motion and feeling, in order to be acquainted with some quality of an external body.

FEELING.

The sense of feeling and muscular motion are ordinarily considered as combining to constitute

one sense; and this sense of touch, as it is called, produces, according to a great number of philosophers and physiologists, many instinctive labours of animals, and the mechanical arts of man. Thus it is said that the proboscis of the elephant gives to this animal his intelligence; that the beaver builds its hut, because it has teeth fit to cut, and a tail which serves as a trowel; that the swan lives in water because its feet are natural oars, &c. On the other hand some philosophers and physiologists, who believe in chance, maintain that man and animals make use of their external instruments, because these instruments exist, and they do not consider the external instruments as the source of the faculties. I do not agree with either of these opinions. The order and regularity of all phenomena in man and animals—of all nature, seem to me to be in contradiction to mere chance, and to the latter opinion. My understanding forces me to admit a final cause: yet I am also convinced that this final cause cannot be understood by man.

THE INSTRUMENTS ARE NOT THE CAUSE OF THE FACULTIES.

The first of these hypotheses, that the external instruments produce the determinate faculties, may be easily refuted. A great number of insects exert different instincts before their antennæ, or their external instruments, are developed. Many animals have those instruments to which peculiar faculties are attributed, yet these instruments do not in them pro-

duce the corresponding functions. Would it not be more natural to suppose that apes and monkeys possess the power of constructing because they have hands, than to suppose that the beaver builds because it has a tail? Monkeys indeed have hands, and they can put wood on a fire; but have they understanding enough to keep up the fire? According to this opinion insects, crawfish, lobsters, and especially cuttle fish, ought to have exact ideas of extension, size, and of geometry in general, in consequence of their numerous and perfect organs of touch.

The external instruments, moreover, are often similar, while the functions performed by them are quite different. There is great variety in the form and texture of the cobwebs, which different species of spiders make in order to catch flies. What diversity of structure in the nests of birds whose bills are similar? Animals of the same genus vary much in their food and their manner of living. The large titmouse builds its nest in hollow trees; the long-tailed titmouse in clefts of branches; the bearded titmouse, among reeds; the titmouse of Poland suspends its delicate and curious nest on a slender branch; whilst the cuckoo, though it is endowed with a bill and feet fit to build, does not build at all. The hare and rabbit have similar feet, yet the hare lies in the midst of the fields, while the rabbit makes burrows.

On the contrary, similar functions are observed in animals which have instruments quite different. The proboscis is to the elephant what the hand is to man and to the monkey. It is by means of the

bill, that the swallow attaches her nest to the wall, and that the thrush cements together the interior of hers; while it is by means of his tail, that the beaver covers his hut with mud. The hands of monkeys, and the feet of parrots and squirrels are certainly different; yet by means of these instruments they hold up their food when they eat. In order to dig up truffles, the hog ploughs the earth with his snout, and the dog scratches it with his feet. According to our manner of thinking, similar internal faculties produce similar effects by means of quite different instruments.

There are, moreover, in man and animals many faculties which cannot be considered as the effect of external instruments. Who, for example, can show, from any external organ, why crows live in society, and magpies in pairs; why the cuckoo and chamois are wild by nature, and the pigeon and goat are tameable? why bustards and cranes place sentinels? why ants gather provisions &c.?

Finally, even in mankind there is no proportion between the manifestations of the faculties and the perfection of the external instruments. If man owe his arts to his hands, why do not idiots invent?—why do painters drop the pencil, sculptors the chisel, and architects the compass, as soon as their understanding is deranged, while other individuals bring forth stupendous works by the assistance of crippled hands or of stumps. Who can measure capacities and talents for the art of building, according to the conformation of the hands? From these considerations, we consequently see that the ex-

ternal instruments do not produce the faculties. I do not however deny the importance of these external instruments. It must even be admitted that there is some relation between the internal faculties and the external instruments. Without external instruments, the internal faculties cannot manifest themselves; without muscles, the will cannot actuate any limb; without hands, or something equivalent, we cannot seize any object. Carnivorous animals could not destroy without claws and teeth; without these instruments therefore they could not even subsist. Moreover, when the instruments are most perfect, the manifestations of the internal faculties are also most easy and perfect. Nevertheless it is unquestionable that the inclinations, propensities, and intellectual faculties, which make use of the external instruments, must be derived from within.

It remains to be considered, whether acuteness of feeling produces the instinctive labours of animals and the mechanical arts of man? Experience shows the contrary. There is no proportion between the fineness of the skin, or the acuteness of feeling, and the manifestations of the faculties of the mind. Some individuals have rough hands and an obtuse feeling, and yet produce surprising works. No artist has ever judged of the capacity of his disciples according to the acuteness of their sense of feeling. It is even still a question, whether the feeling of man is more acute than that of animals? This is indeed generally believed, because the skin of man is destitute of hair, and covered only with a thin

epidermis, while the hair of quadrupeds, and the feathers of birds, diminish their sense of feeling. There are animals however which are destitute of hair, as the elephant, the Turkish dog, snails, &c. and yet their feeling is very acute. Other animals, though covered with hair, as the horse, dog, &c. immediately feel those insects which rest on their hair. Finally, it is even impossible to conclude that, because the skin is covered with hair, the feeling is less acute. Sometimes in diseases, the hairy scalp of man grows extremely sensible, and the least touch of the hair produces great pain: the epidermis at the anterior part of our fingers is the thickest, and yet the feeling of these parts is considered as the most acute. Consequently the feeling nerves of animals, though covered with hair, might be more sensible than other nerves which are destitute of hair: and it is not obvious that the feeling of man is more acute than that of animals.

Thus, the ancient doctrine of Anaxagoras, that the hand of man is the cause of his understanding, falls to the ground: and it is evident that the wisdom of Solomon, Solon and Plato, and all the master-pieces of Homer, Euclid, Raphael and others, are by no means the result of their hands; and that the surprising instincts of animals are not the effects of their antennæ, or of their feet, teeth, probosces, or tails. I repeat, that it must nevertheless be allowed that the external instruments, though not in proportion to the internal faculties, cannot be in contradiction to them; and that these faculties perform their functions with greater facility and in

higher perfection, if the external instruments be more perfect. Therefore the hand of man which is divided into several moveable parts, and capable every moment of changing its form, and of closely surrounding the surface of external bodies, is more fit for appreciating their tactile qualities, than the feet of birds invested with scales, or than those of quadrupeds covered with a horny substance. Yet it is not the less certain that the external instruments are never the cause of the internal faculties.

OF THE PREROGATIVES ATTRIBUTED TO THE SENSE OF FEELING.

It has often been observed that without touch man would not have any consciousness of an external world. It is said that man by moving finds limits and resistance to his motion, and that thereby he is warned of some external existence. Our eyes however are limited, as well as our desire to move; and consequently it would be possible to perceive the external world by sight, even if we could not by touch. Moreover, the sentient power does not reside in external organs, but in the mind. I cannot therefore conceive why the sentient being should not be acquainted with the impressions which happen to it indistinctly, as well as with those which are made upon it only at the moment when it endeavours to act, and is prevented from doing so. In both cases there are only external impressions. For what reason, also, does the sentient being, which has no consciousness of the external world,

make any motion? Why do insects and many animals act as soon as they are born? The young tortoise and duck, though scarcely hatched, run toward the water without ever having previously touched it. How do they thus distinguish water from solid bodies? How can young birds possibly be acquainted by touch with those branches upon which they sit down for the very first time on leaving their nest?

All our observations, and even nature herself, are in opposition to this hypothetical opinion. Two things then must here be observed. First, that man and animals are naturally much more disposed to transfer their internal sensations as to external objects, into the outward world, than to concentrate as it were external nature within themselves. We see and hear from without: at least it seems so to us. The child, without being instructed, turns his head towards the place whence comes the light and sound, which make impressions upon his eyes and ears. The afflux of blood towards the optic nerves makes us see a flash of light, and towards the auditory nerves makes us hear a tingling sound. In dreaming we see landscapes, persons and carriages; we hear music, we walk in parks, and have a thousand similar sensations. Madmen hear heavenly choirs, and see angels; and even visionaries consider these internal sensations as realities, and distinguish the figures of their genii, &c. All these and similar phenomena take place inwardly, but by the mind they are transferred into the external world.

It is also to be observed, that the faculty of sepa-

rating external impressions, and the external world, from the internal sentient power, cannot be attributed to any external sense: this faculty is of a higher nature, and exists internally as well as the faculty which says, I feel, hence I am. It is a very different thing to perceive any impression, and to know this faculty and reflect upon it. This internal faculty of knowing the existence of external objects acts by means of all the external senses; and the sense of touch has, in this respect, no preference. Tracy* has very well demonstrated that the sense of touch has not the prerogative of producing the notion of the external world. He says, the nerves are merely agitated by various impressions. This is the case in respect to the auditory, optic and olfactory, as well as in respect to the tangent nerves. For what reason, then, should touch alone excite the idea of some external cause?

The second prerogative, attributed by Buffon, Condillac, Cuvier, Dumas and others to the sense of touch is, that it alone produces the ideas of space, dimension, extent, distance, figure, number, motion and rest. It is only however necessary to examine the functions of animals in order to prove that this assertion is incorrect. Animals which acquire no instruction, or at most a very defective kind of it, from touch, yet judge of distance, figure and plurality. If the swallow and bat with incredible swiftness catch flying insects, do they not measure the distance? When young birds leave their nest for the first time, do they run their heads

* Ideologie, Tom. i. p. 114.

against houses and trees, instead of sitting down upon a branch? Do we observe young animals, which have never yet left their native place, run away indifferently whether they perceive an enemy far off, or near them? Animals born with imperfect eyes, or altogether blind, can neither see external objects, nor measure distance; but those which are born with perfect eyes immediately see, and exactly measure distance, figure, motion and plurality: thus the young partridge, quail and duck, avoid from birth every object which lies in their way. It is therefore evident that the sense of touch has not the prerogative of producing the ideas of extent, distance, form and motion. Locke long ago demonstrated this truth; and it is certain that not only touch and vision, but also hearing and smell may excite the ideas of distance, direction, motion and plurality. Hence animals turn toward the wind, and judge of the direction in which impressions come.

The observation that the ideas of extent, form, distance, motion and plurality, are excited by different senses, is to me an evident proof that none of these ideas can be attributed immediately to any external sense. For I have already mentioned it as an axiom that no special faculty manifests itself by means of two or several organs, but that the manifestations of every special faculty are attached to some particular organ. My reasoning is also confirmed by facts and by direct proofs. The faculties of knowing and measuring space in general, and of distinguishing distance, form, number, motion and rest

are not in proportion to the five external senses to which they are attributed, either in animals or in man. Moreover, these faculties, which are internal, act and produce their respective sensations without being excited by the sense of seeing or touch; in birds, for instance, which migrate; in dogs and pigeons which find again the places to which they are attached, without being acquainted with interjacent objects; and in birds which build their nests conformably with those of their parents without having been instructed: faculties which act from within without any external excitation of touch and sight. Finally, the physiology of the brain shows that there exist particular organs of these faculties, and proves that their manifestations are in proportion to their respective internal organs. These faculties therefore must be separated from the functions of the external senses, and attributed to particular internal organs.

The third prerogative, ascribed to the sense of touch is, that it is the surest of the senses, and that it rectifies and corrects the other senses. In treating of the external senses in general, I have proved that no sense acquires its faculty by means of another, but that each has it from nature independently; that every sense is subject to particular laws; and that its functions are perfect or imperfect according to its proper organization. Thus from this consideration it follows that touch neither produces the faculties of the other senses, nor rectifies their errors. Indeed it is easy to prove both by the healthy and the diseased state, that the sense of

touch is not surer than any other sense, and that it does not rectify the other senses any more than these rectify the sense of touch.

If we cross two fingers, and touch a round body, a pebble, for instance, or a pea, we seem to feel two bodies. If we place a thin flexible paper between the fore-finger and thumb of any person, he does not feel it. In various diseases, the patients think that they receive impressions from without, and feel warm, hot, cold, various pains, &c., just as they hear voices which are produced by some internal cause. Those who reflect on these considerations, together with those I have formerly made above as to the rectification of the different senses, will be convinced that the sense of touch is not surer than any other sense, and does not rectify the other senses any more than these rectify the sense of touch.

It may still be asked, whether feeling produces the ideas of consistency, of hardness and softness, of solidity and fluidity, of weight and resistance? I think it does not. For in order to examine these qualities of external bodies, the mind employs the muscular system rather than the sense of feeling properly so called. There is, also, no proportion between the faculty of measuring those qualities of external bodies and the sense of feeling, or even the muscular system. Moreover, the sense of feeling may be lost; but if the muscular power remain, we may perceive the weight and consistency of external bodies though feeling cannot contribute to it. Now the muscular functions are

excited by internal causes, and therefore the ideas of the weight, resistance and consistency of external bodies, are the result of an internal faculty. I once for all make the general observation that, when any function is the result of the active state of any external sense, we may be sure that the faculty which conceives the ideas is internal. For the same reason, we have seen above, that the faculties which conceive the extent and size, the form and number, of external bodies, are internal. In this manner we may also conceive how the internal faculties make use of different external senses if that be possible, and how sometimes they can make use only of some particular external intermedium. The mind, for instance, wishes to move the body from one place to another, and this can be done only by means of the muscular system; the mind wishes to perceive music, and this also can be done only by means of the auditory nerve; but the mind wishes to perceive the size or form of a body, and this may then be done either by the sense of sight, or by that of feeling. Notwithstanding these modifications, it remains always certain that every re-action of the mind upon external bodies has its cause in some internal faculty, while the sensations, which result from the passive state of the five external senses, constitute their immediate sphere of activity.

IMMEDIATE FUNCTIONS OF THE SENSE OF FEELING.

The sense of feeling is of all the most extensive, being continued not only over the whole external

surface of the body, but even over the intestinal canal. It produces the most general perceptions of pain and pleasure, the sensations of temperature, and those of dryness and moisture. All its other functions are only mediate. Even the ideas of roughness and smoothness belong to an internal faculty; namely, that of form. In respect to the mediate functions, the sense of feeling may be called touch, of which the sphere of activity is very considerable and important: it is principally combined with voluntary motion, and the two kinds of nerves on which these depend may then assist all internal functions, both moral sentiments and intellectual faculties. Hence it is evident why the connexion of the nerves of feeling and motion, with the organs of the moral sentiments and intellectual faculties, is the most intimate. For it is a circumstance both conceivable in itself, and proved by experience, that the five external senses are in connexion with the cerebral organs which they assist; and as the nerves of motion and feeling may assist all internal faculties, they also are connected with all the internal organs, in the same way as the nerves of feeling and motion are connected with each other.

TASTE.

No moral sentiment, nor any intellectual faculty, has been supposed to be derived from the taste. This is the second sense by means of which man and animals become acquainted with external bodies, when they touch immediately the sentient organ.

After feeling, this sense seems to be the most general and the most indispensable in living beings which consciously take food. It seems also that this sense is active very early in life. The fifth pair of nerves, several branches of which are distributed to the papillæ of the membrane covering the palate, the velum pendulum, the pharynx and chiefly the tongue is developed in new-born children, in the same way as are the nerves of motion and feeling.

It is a common opinion that the acuteness of the taste depends not only on the nervous papillæ of the tongue, but also on its flexibility, softness and moisture. Ackermann, who derives the perfection of the human mind from the acuteness of the five senses, asserts that the nerves of taste are proportionally more considerable in man than in animals; that the tongue of man is the most flexible and soft, and that his nervous papillæ are covered with the finest skin. In many animals, however, as in dogs, monkeys &c. the skin of the tongue is as thin and fine, and its structure as flexible, as in that of man. The mobility of the tongue has indeed less relation to the taste than to the function of speech. The principal requisite of an acute taste is certainly the largeness of the gustatory nerves, and of the surface which they supply; but, in this respect, many animals surpass man. In many animals, the lingual nerve, as well as the whole of the fifth pair, is much larger than in man; the nervous papillæ of the tongue are also more numerous, and their apices more extensive. Though the tongue of several animals is covered with a much rougher skin, these

animals distinguish and select certain plants which are comformable to their taste, and reject other vegetables which are contrary to it. Moreover, if it be considered that eating procures to animals the most exquisite and permanent pleasure, and that a great number of animals, while awake, pass almost all their time either in eating or in ruminating, it will be difficult to deny that the taste of many animals is more perfect than that of man. Hence, if any one expect more considerable intellectual faculties from a more perfect organization of the organ of taste, he ought at least to show that such animals as the dog, horse, ox &c. have employed those intellectual faculties to render perfect the methods of gratifying that sense.

We cannot adopt the opinion of those naturalists who maintain that the taste of birds is very obtuse: it seems, at least, that this is not generally the case. Blumenbach has shown that the organ of taste is large, and the sense very exquisite, in ducks. It is indeed for this reason that a great number of birds do not swallow their food suddenly: the titmouse for example, laps it: the greater number of birds which live upon insects, grains and berries, crush and bruise them: if we present to the canary-bird, to the bulfinch, nightingale &c. different sorts of food, each of them will choose that sort which is most agreeable to it: if we present ant's eggs to young nightingales, many of them will rather die of hunger than use them, because they are unacquainted with that sort of food; and if we put these eggs into their bill they commonly throw them

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away; but if we break the eggs, they swallow them with the greatest avidity, and hence it is evident that their taste is fine. Even the birds which swallow their food suddenly, as the cock, hen, pigeon &c. distinguish different berries and seeds even by touching them with the extremity of their bill. If we mix the seed of vetches with that of robinia caragana, pigeons and hens will take them indiscriminately in their bills, but they will always throw away the latter. These birds prefer therefore, like others, one sort of food. If we tame storks, and accustom them to catch in their bills rats and mice thrown to them, they throw them several times in the air, catch them every time, and then crush and swallow them greedily. But if we fling at them a toad they catch it, and then immediately throw it away. They eagerly eat bees and large flies; but if they catch any insect with which they are displeased, they throw it also away. Such also is the case with swallows, and all birds which live upon insects.

These observations render it improbable that every insoluble body is insipid, or that every body, in order to affect the organ of taste, must be soluble in the mucus which covers the tongue. In many physiological writings, the axiom of chemistry, *corpora non agunt nisi soluta,* is applied to the organ of taste. " The tongue," says Richerand, " is covered by a mucous, whitish, yellow, or bilious slime. This covering, more or less thick, prevents the immediate contact of sapid particles, and we have only a false idea of tastes. All aliments seem bitter if a bilious disposition exist, or insipid if there

be a superabundance of mucus." But it seems that the tongue may perceive many aromatic, oleaginous, or other impressions produced by seeds and insects, without being dissolved and mixed with the mucus which covers the tongue.

Dumeril, professor of Physiology at Paris, maintains (in an Essay on the Smell of Fishes) that fishes are destitute of the sense of taste, which, according to him, is replaced by the taste of smell. Fishes, says he, have not the hypoglossal nerve, and the continual pressure of the lingual nerve by the water must blunt the sensibility of the tongue. Now in the supposition that fishes are destitute of the hypoglossal nerve, it does not follow that they have no taste; for the hypoglossal serves only for the motion of the tongue, while a branch of the fifth pair, which exists also in fishes, is the sole organ of taste. The tongues of many fishes are also covered with numerous nervous papillæ, and the anterior part of their tongue is even moveable, flexible and soft. Hence there is no anatomical reason to deny taste to fishes; and it is even in consequence of their possessing this sense that they may be taken with bait. On the other hand, if the pressure of water blunt their taste, why should not the same pressure blunt also their smell? But pressure produces no such effect: for some persons walk during the greater part of their lives, yet the soles of their feet do not lose their sensibility. In short, it seems that this opinion of Dumeril is more remarkable for singularity than for any foundation in anatomical and physiological observation.

The lower animals also must have nerves of taste. Hence insects prefer different food; though their gustatory nerves have not yet been discovered. Neither in man nor in animals can taste be considered as an infallible guide to the wholesomeness of the thing which is tasted. Repugnant aliments may be wholesome, while substances which are eaten with pleasure may act like poison on the stomach or the intestines. The taste of patients is often an indication conformable to the nature of their disease; but no reasonable physician will have in it unbounded confidence. The sense of taste, however, has necessarily the most intimate relation to the whole system of digestion and nutrition. I have already mentioned that this sense is modified in different kinds of animals, and in different individuals of the same kind, even in different ages, and in the states of health or disease. As the organ of taste is the first which is developed, so it seems to be the last which loses its activity. Old persons commonly esteem good food, which also is necessary for them. When their sight is extremely weak, when they are almost deaf, and when their skin is wrinkled, stiff and almost insensible, they drink and eat as heartily and with as much pleasure as their grandchildren.

The sphere of activity of this sense is confined to the sensations of taste; that is, it perceives only impressions of savour. *Mediately*, it gives assistance to nutrition. The nerves of taste have the most intimate connexion with the nerves necessary to the motion of the jaws, with the nerve of the

organ of voice, and with the glossopharyngeal nerve. Accordingly, the organs on which these nerves are expanded exert the greatest influence on one another.

SMELL.

By means of smell the external world begins to act upon man and animals from a distance. Thither odorous particles are detached from bodies, and inform man and animals of the existence of the bodies to which they belong. Several physiologists consider smell as a completion of taste, or as a finer and higher degree of taste. But the olfactory nerve constitutes a particular system: it is the explorer and the guide of the sense of taste. This sense must exist in lower animals, as in insects, since they are attracted by odorous objects, yet their olfactory nerve has not yet been discovered.

Dumeril, according to whom fishes have no taste, thinks that their smell is its substitute; and in order to support his opinion, he maintains that odorous particles cannot be transmitted by water. We have already seen that the organ of taste does exist in fishes, and it is not probable that nature has produced any organic apparatus without an appropriate object. It is besides strange to maintain that odorous particles cannot be transmitted by water, as fish and craw-fish are taken by bait. It is remarkable that this sense should not exist in cetaceous animals which occupy so high a place in the scale of being.

Dumeril thinks also that their taste takes the place of the sense of smell.

It is generally admitted that many animals excel man in respect to the acuteness of smell: their whole olfactory apparatus is larger. It is as large in the most stupid as in the most skilful animals—in the ox and hog, as in the horse and dog. Hence the subtile smell of hogs and dogs serves to detect certain roots, truffles, for instance, which are buried in the earth. These animals are led to the place where the truffles are suspected to be, and they burrow in the earth in which the truffles lay concealed.

Cuvier maintains that the olfactory nerve is larger in carnivorous than in herbivorous animals; but there is no relation between the acuteness of smell, and the instinct of eating flesh or vegetables. Man who is omnivorous, and the sea-calf which lives only on fish, have both very small olfactory nerves. The fish, turtle, mole, sheep, ox, horse, &c., however different their food, have an olfactory nerve proportionally larger than the wolf, dog, tiger &c. Comparative anatomy therefore opposes Cuvier's opinion. Comparative physiology leads also to the contrary conclusion; herbivorous animals take many hundreds of plants for food, while carnivorous animals live commonly upon a smaller number of animals: in order, therefore, to distinguish their food, the organ of smell in herbivorous animals should be larger than that of carnivorous. Moreover, if nature endowed carnivorous animals with a very acute

smell in order to find out and trace emanations from animals destined to be their prey, it is improbable that nature should have refused to the weak victim the advantage of an acute smell, in order to detect its enemies and to escape them.

Odorous impressions act powerfully upon the brain; and this circumstance induces us to apply to these nerves stimuli calculated to revive sensibility when life is suspended, as in cases of weakness and suffocation or asphyxia.

A great number of physiologists attribute to the sense of smell the surprising faculty of many animals, by means of which they again discover their dwellings; but there are many phenomena of this kind which cannot be explained by smell alone. A dog, for example, at the end of several months, and at a distance of more than a hundred leagues, finds his former dwelling and master; though he has been carried away in a coach; though it has rained repeatedly during this interval of time; though the dog has gone by water and comes back by land; though he is obliged to make circuits instead of taking the nearest way, and though the wind has changed in all directions. Moreover, pigeons transported to a distance of twenty or even of fifty leagues, and shut up for several weeks, return to their former residence; and the falcon of Iceland, confined for several months, flies away at the first moment of its freedom &c. These and similar phenomena it is impossible to explain by the sense of smell. It is necessary to admit still another superior faculty, sometimes called the sixth sense.

It remains to be determined what is the sphere of activity of this sense. The immediate functions of smell consist in perceiving the odorous particles of external bodies, and in thereby informing man and animals of the existence of their aliments &c. All its other functions are mediate. It assists the faculty which conceives the existence of external bodies; it indicates to animals the proximity of friends and enemies; and it leads those which live solitary to their companions, when they are incited to propagate their species.

It appears that the olfactory nerve is most connected with the anterior lobes and with those convolutions of the brain which are situated sideward and outward. In animals, this sense assists chiefly the faculty which knows individuals. The nose is also near the mouth, on account of their necessary relation one to another.

HEARING.

Hearing is the fourth sense which makes man and animals acquainted with remote objects, and the first which perceives external objects by an intermedium, namely the air. The auditory nerve is found from man down to the cuttle-fish, below which an organ of hearing has not been distinguished, though several animals, lower in gradation, are not destitute of the sense. The auditory apparatus becomes more complex in proportion as animals are more perfect; and this is the case both with the external and internal ear. Except Ackermann, all

physiologists allow that many animals surpass man in the faculty of hearing. That physiologist, however, deriving the superiority of human understanding solely from the external senses, asserts that the hearing of man is the most perfect on account of the cochlea of his ear, which, according to him, is the most essential part, and is wanting in animals. This assertion may, however, be refuted, both anatomically and physiologically. First, it is certain that the organ of hearing is more perfect in many animals than in men; that their external ear is larger and more moveable, so as to turn in all directions and be opposed to soniferous undulations; and that those of their muscles which are destined to this function are also larger and stronger. Moreover, the hearing apparatus of many animals presents large cavities, which increase the sonorous vibrations, and which cannot be confounded with the mastoid process of man: in some, these are empty; in others they are divided into a greater or less number of compartments; and in the ox they are composed of many concentric partitions. The auditory nerve is also much larger in many animals, as in the ox, horse, stag, sheep &c. than in man; and even the cochlea not only exists in many animals, but is in many even more perfect than in man. Hence, it is anatomically proved, that the organ of hearing is in many animals larger and more perfect than in man. The same may be demonstrated *physiologically*. In observing the functions of animals, we may convince ourselves that many of them perceive sounds which are im-

perceptible to man. It must therefore be admitted that many animals surpass man in the sense of hearing.

In new-born-children, this sense is not yet active, but it improves by degrees, and in proportion as its organ is developed. In the same way the auditory power decreases in proportion as the vigour of the organ of hearing decreases. Several authors maintain that the deafness of old persons depends on the blunted sensibility of the auditory nerve: they think that repeated impressions exhaust sensibility. It is indeed true, that sensibility is blunted and exhausted by too great activity; but I think that, in the ordinary state of health, dulness of hearing in old persons depends on the decrease of the auditory apparatus. In young and sound persons the nerve of hearing is expanded in a humour which occupies the cavities of the internal ear; and in old persons this humour diminishes at the same time that the nerve itself decreases. Hence Pinel, who during the severe winter of 1798, at the hospital Salpetriere, caused the skulls of several women to be opened, who died at an advanced age and had, for several years, lost their hearing, found the cavities of the internal ear perfectly empty; while they were filled with a cake of ice in younger persons, who had possessed the faculty unimpaired.

It is a very common opinion that music and the faculty of speech are the result of the sense of hearing. Yet neither one nor the other is produced by that sense. I shall first show that hearing cannot produce music. Now Le Cat, Ackermann and

others think, that the cochlea is the most important part of the ear, and the principal instrument of the musical faculty; and Ackermann accordingly maintains that man alone has the cochlea. Different quadrupeds, however, not only possess this part, but have it also more perfect than man. Sheep, cats, dogs, and hogs, have the cochlea: yet these animals certainly are not fond of music. Hence, the opinion of Ackermann is without foundation, and even that of Le Cat is erroneous, because in many animals, which are not sensible to music, the cochlea is more perfect than in man. Besides, birds, whose ear is almost destitute of this part, yet sing. Le Cat, knowing this contradiction, answered that the whole skull of birds is more sonorous than that of quadrupeds, because their skulls are less covered with muscles; and he thinks that if nature had joined a cochlea to the sonorous skull of birds, they would be still more sensible to harmonious modulations, and as passionate for harmony as almost all animals are passionate for food: but, continues he, because birds are destitute of the cochlea, their musical talent depends more on their throat. In this Le Cat is mistaken: there is a great number of singing birds, the skulls of which are covered with more muscles proportionally than those of many quadrupeds which chew no hard food, as the ant-eater &c. The heads, moreover, of the goldfinch, bullfinch, chaffinch, linnet &c. are covered with great muscles, while the head of the green wood-pecker, which certainly is not a melodious bird, is almost destitute of muscles. The

heads of the hoarse March thrush, of the monotonous cuckoo, of the miserable babbler of Bohemia &c. are not covered with more muscles than the skulls of the sweet mocking bird, of the melodious blackbird, and of the vineyard thrush with its delightful song. If we suppose that the whole skull of birds is sonorous, the only consequence to be drawn from it would be, that a weak sound is greatly strengthened in them; but it would be inexplicable why certain birds are so fond of singing, and why some nightingales have continued their song till they died from exhaustion.

Hearing in general cannot produce music, because there is no proportion between hearing and the faculty of music, either in animals or in man. Many animals hear very acutely, and are yet insensible to music. Among birds the female hears as well as the male: if hearing then produce music, why does not the former sing? Among mankind there are individuals whose hearing is very obtuse, and whose talent for music is, yet, very considerable. Finally, hearing cannot produce music, because hearing perceives only tones which are already produced. The first musician, therefore, began to produce music from an internal impulse, and that music of course he had not previously heard. Singing birds, moreover, which have been hatched by strange females, sing naturally, and without any instruction, the song of their species as soon as their internal organization is active. Hence the males of every species preserve their natural song, though they have been brought up in the society of indi-

viduals of a different kind. Hence also musicians, who have lost their hearing, continue to compose. Hence likewise deaf and dumb persons have an innate sentiment of measure and cadence.

Le Cat confounds the crying of dogs at the sound of a hunter's horn, and the stamping and neighing of horses at the sound of a trumpet, with the sentiment of music. If this were the case, we must allow that reptiles, fishes &c., even bees and spiders, which are allured by sound, are sensible to music. Buffon, Dumas, Bichat and others think that the talent of music depends on the equality of the power of hearing with both ears. If, however, the inequality of both ears were sufficient to prevent the perfection of music, a good musician would be extremely rare; for by far the greatest number of men hear better with one ear than with the other. From all this it follows that hearing does not produce music. It is, however, to be considered that hearing is necessary to perceive and to execute music. This consideration belongs to the sphere of activity of each faculty; and I here intend only to prove that hearing cannot produce music.

Some authors derive music, and the singing faculties of birds, from the larynx or throat, and its faculty the voice. If, however, the larynx produce the instinct of singing, why do not all animals endowed with this part manifest the faculty of singing? Cuvier, moreover, has examined the larynx of many birds, and found its structure similar in some which sing, and in others which do not sing. What difference also is there between the throats of the

males and females of the same species? Is there even in man any proportion between the agreeableness of the voice and the talent of music? Nay; have not many individuals great musical talent and little voice; and do not others sing very agreeably without excelling in music? Music, therefore, is neither the result of hearing nor of voice. I now shall show that neither hearing nor voice can produce the faculty of speech.

It is then a very common opinion that hearing alone, or hearing and voice conjointly, produce the faculty of speech. The best way to refute this error is by inquiring, in what any language consists, and how every language is produced? Language in general is the medium by which sensations and ideas are mutually communicated; and this may be effected by sounds, gestures, or by other signs. Language, then, may be divided into two classes: into natural and artificial, arbitrary or conventional.

It is a natural law that the internal faculties of man and animals, as soon as they are active, manifest their activity by the intermedia between them and the external world—by the five external senses, and by muscular motion. These external manifestations take place according to determinate laws; and, though modified in every kind of animal, they are always conformable to certain kinds of sensations or ideas. The horse neighs, the lamb bleats, the cow bellows, the child cries &c. according to their wants. This natural language is general, because all animals need to communicate their sensa-

tions, were it only for sexual purposes. We commonly observe that animals which live in society communicate their wants, and the approach of danger, or of an enemy. To what purpose their calling, their placing sentinels, their sounding alarms, if they did not understand one another? Unless this were the case hunters could not deceive animals by imitating their voice or manner of calling? We must, therefore, allow with George Le Roi, Condillac, Dupont de Nemours, Tracy, and many others, that animals have their peculiar language, and that this language is proportionate to their faculties.

It may be objected that the language of animals has no words. Animals certainly have only natural language, and it consists partly of sounds and partly of gestures, like the natural language of man, which is also destitute of words. Man, however, has, besides his natural language, a particular faculty of producing arbitrary signs, whether sounds or gestures, or other indications. Animals, on the contrary, are destitute of this faculty of producing arbitrary signs, and have only that of learning the various arbitrary signs of man. Hence cats, dogs, horses, oxen &c. learn the language of every nation, as far as they have the related sensations. Thus a dog may learn the signification of *eating*, *manger*, or *Essen*; but no animal can understand a sign, whether natural or arbitrary, if it be destitute of the related sensation or idea. Under the physiology of the brain, we shall consider the faculty which produces arbitrary signs, and also that which acquires them. I here intend only to prove that neither

hearing nor voice produces the faculty of speech; and that both are in respect to language what they are in respect to music, that is, only certain intermedia, or means of manifestation. There are, then, animals which can pronounce words, imitate various sounds, and hear very well, but which nevertheless have no arbitrary language. Some imperfect idiots also hear very well, and pronounce with facility the words they know, but cannot maintain a conversation. Their mode of communication, or their language, becomes consistent exactly in proportion to their internal faculties. Moreover, if the mind and understanding are deranged, orators and poets become dumb, or their eloquence is changed into incoherent raving. It is therefore evident that the faculty of speech does not result primitively from the voice and hearing.

With regard to the immediate function of the sense of hearing, it is confined to the perception of sounds; yet it assists a great number of internal faculties. It may readily be conceived, that in different beings the sense of hearing must be modified, and that in relation to the internal faculties which act by it; in the same way as even external objects are adapted to internal faculties, or internal faculties to external objects; in the same way, for instance, as the laws of vibration, though they exist without in external vibrating objects, must be conformable to the laws of the internal faculty of tune; or in the same way as the relations of size, number, and succession, which exist in the external world, are calculated for their respective internal faculties.

Besides the internal faculties of speech and music, there are yet others which act upon the external world by means of hearing, and which are commonly attributed to this sense. Here I must consider an error which was once very common, and in which even Kant and Herder have participated, namely, that it is impossible to communicate any abstract notion to the deaf and dumb. Le Cat says, that deaf persons are more unfortunate than the blind, because many truths are heard, and very few are seen. Herder even thought that deaf and dumb persons imitate all they see done, whether good or evil. These and other erroneous opinions relative to deaf and dumb result partly from the common error that our sensations and notions are produced by the external senses, or that nothing exists in the mind except what comes by the senses, and partly from the error that arbitrary vocal language produces sensations and ideas. It is, however, certain that all the internal faculties may exist without hearing, and consequently, that deaf persons, in whom the sense of hearing alone is wanting, may manifest all the other faculties. They are destitute only of this means of communication, and are therefore obliged to make use of other means. Hence they speak, that is, communicate their sensations and ideas, by gesture.

The sense of hearing assists chiefly the moral sentiments, and the faculties of space, individuality, tune, and speech, and thereby all the intellectual faculties and sentiments. The auditory nerve in particular has a more intimate connexion with the

organs of the moral sentiments than with those of the intellectual faculties: it embraces the nervous bundle of the cerebellum, and is connected with the vocal nerves. Therefore the voice, as natural language, is more energetic in sentiments than in intellectual faculties.

SIGHT.

This is the fifth and last of the senses, or the second of those which inform man and animals of remote objects by means of an intermedium—light. Those who attribute the perfection of the intellectual faculties of man to the perfection of his senses, maintain that man has also a more perfect vision than animals. They consider this perfection of sight as resulting from a greater distinctness with which objects are seen by man, and they ascribe this peculiarity to the exact coincidence of the refraction and reflection of the rays of light, to the transparency of the diaphanous parts of the eyes of man, to the irritability of his iris, and to the position of his crystalline lens. Richerand even believes that the pigmentum nigrum must impede and disturb the distinctness of vision; and that perhaps on this account animals have false and exaggerated ideas of the power of man. Experience answers these errors. The iris of many animals is very moveable, and they see both in the day and at night, and that at a much greater distance than man. If, however, the preceding reasoning were true, the falcon would not perceive the heron at a distance at which the heron is imperceptible to man; the eagle

unseen hovering in the air would not perceive a mouse upon the earth; the turkey-cock would not recognize the distant falcon or other bird of prey, and warn the surrounding brood, when it is impossible for man to distinguish the enemy; and tigers and other fierce animals would not attack man supposed to be thus rendered formidable. It must therefore be allowed that the sense of sight is more acute in many animals than in man.

None of the senses has more occupied physiologists and philosophers, than those of sight and touch; but it is with regard to them also that the greatest number of errors has been committed. Many erroneous opinions have been, and are still, maintained in respect to vision. It has been said that this sense acquires its faculty either by touch or by habit; but in speaking of the generalities of the five external senses, I have already proved that no sense acquires its faculty, either from any other sense, or from habit. Vision depends on the organization of the eye; and, according to it, is weak or energetic, imperfect or perfect. Some animals come into the world with perfect eyes, and these animals see perfectly from the first. The butterfly and honey-bee fly at the first attempt through fields and flowery meadows, and the young partridge and chicken, as soon as they have left the shell, run through stubbles and corn; while other animals, which are born blind, distinguish the size, shape and distance of bodies only by slow degrees. This latter is the case also with new-born children. I cannot enough inculcate that every sense has its own laws, and that

its functions depend on the healthy and perfect state of its organization. In the looking glass we see ourselves and other objects enlarged, diminished, lengthened, shortened, multiplied, near, distant &c. according to the laws of the refraction of light.

It is also maintained by some, that without the sense of touch, the eyes would represent to us all objects in a reversed situation, and double, and that all objects would seem to be in the eyes, because the objects are painted on the retina. The reversed impressions of objects really do exist in the eyes; but, as Berkeley and Condillac have elucidated, objects are not painted on the retina, and that membrane is only agitated by the impressions of light. The difficulty, however, why we see the objects upright has not been resolved. An internal faculty makes us acquainted with the external world; and man is more disposed to transfer all internal sensations and ideas of external bodies, into the outward world, than to concentrate external impressions inwardly. According to a law of nature, the impressions of the five senses are not merely transferred into the external world, but even to the place and the distance whence they come. We think that the sonorous body is in the direction whence come the vibrations of the air; and if animals take wind they do not look for the received impressions in an opposite direction. In the same manner, the impressions of light are referred to the place whence they come; and consequently the luminous impressions which come from above are referred upwards, and those which come from below are referred

downwards, and the object is thus seen in its right position.

No one recollects his having in infancy seen any object reversed; and natural history does not present any such example in animals. According, however, to these hypothetical absurdities, young birds ought to take the root of a tree for its top, &c. &c. It is to be observed in general, that natural philosophers and physiologists, in the examination of the five external senses, restraining their reasoning only to man, have entirely forgot animals. In treating of the generalities of the external senses, I have already spoken of vision being single, although its impressions are double. I have also spoken of the possibility of distinguishing distance by means of the eyes; and I have shown that animals are unable to measure exactly the distance between themselves and external bodies, only when their eyes are imperfect. Thus the organ of vision possesses its peculiar faculty; the manifestations of this faculty depend on the state of its proper organization; and vision is like every other sense subject to invariable laws. A straight stick plunged in water must appear crooked. If a vessel is filled with water, we see a stone or other body at the bottom, which we cannot see in the same situation if the vessel be empty. The deepest philosophers and the most learned men, notwithstanding all contrary conviction, see their images behind a looking-glass, as do parrots, monkeys, and children. We see our persons reversed in the concavity of a spoon held upright, while our right hand appears on the left

side, and our left hand on the right side; but in a conic looking-glass, convex in the circumference and concave from the basis to the top, we see our persons also reversed, but the right side opposite to our right side, and the left side opposite to the left, as in a common looking-glass. We know that in two rows of trees the last trees are as far distant from each other as the nearest, yet the distance of the two rows appears to become narrow as they recede. A square tower at a great distance appears round; and very large trees which are distant do not appear larger than small bushes which are near. All these and similar determinations are unavoidable, and accord with the laws of optics.

Those who reproach the sense of sight with the errors we have refuted support their assertions by the experiment of Cheselden on a person born blind. In the description of this experiment of Cheselden, there is no mention of a double or reversed vision during the first moments after the operation. Le Cat, therefore, said that these persons were by touch acquainted with the situation of objects, and consequently their mind could not easily be misled by vision. We, however, ask why was not their mind similarly acquainted with the size and shape of objects? On the contrary, though their mind was informed by touch, that objects were not applied to the surface of our body, yet they appeared so to their eyes. This was the case even with the blind-born individual who underwent the second operation twelve months after the first, and who consequently was already acquainted by one eye with the size

and shape of external bodies, yet the testimony neither of his touch nor of his sound eye was sufficient to persuade his other eye that pictures were not elevated objects.

Diderot has very well answered this reproach against sight. Pictures, says he, produced the same effect upon savages when for the first time they perceived them. They took paintings for living persons, spoke to them, and were much astonished that they did not give any answer. We ought to consider, continues Diderot, that vision cannot be perfect before the organization is perfect. The humours of the eye must have become clear, the iris must be conveniently dilatable, the retina neither too little nor too highly sensible, and the whole eye-ball fit for exerting all the particularities necessary to vision. He also said very well: sight is not necessary in order to be sure by touch that any figure exists; why should touch be necessary in order to be sure by sight that the same thing exists?

It is a common opinion that the art of painting is the result of sight; and it is certainly true that the eyes are as necessary to perceive colours, as the ears are to perceive sounds; but the art of painting does not consist in the perception of colours, any more than music in the perception of sounds. Sight, therefore, and the faculty of painting are not at all in proportion to each other. The sight of many animals is more perfect than that of man, yet they do not know what painting is; and even among mankind, the talent of painting cannot be measured

by the acuteness of sight. Great painters never attribute their talent to their eyes: they say, it is not the eye, but the understanding, which perceives the harmony of colour.

The sphere of activity of the immediate function of sight is confined to the perception of light. All its other functions are mediate. The eyes may accordingly assist all the other external senses, all the moral sentiments, all the intellectual faculties, and principally the latter of these. The connexion of the optic nerve with the brain also shows that the sight assists chiefly the posterior, lateral, and anterior parts of that organ.

From all I have said of the five external senses, it results that their spheres of immediate activity are very limited; that feeling perceives only dryness, moisture and temperature; that taste perceives savours; smell odours; the ears sound; and the eyes light: and hence, that all the other functions are only mediate, or, in other words, that the internal faculties by means of the external senses perceive the various impressions; conceive the peculiar ideas, or are acquainted with the existence of the external bodies and their qualities; and again act upon the external world, by means of the external senses and voluntary motion.

A fact mentioned by Darwin * proves that the five senses are mere intermedia, and that their actions must be propagated to internal operations. An old man, who had suffered a stroke of palsy, perfectly

* Zoonomia, 3d Edit. vol. iv. p. 295.

preserved hearing and vision, but could call up a train of ideas only from the latter. When he was told it was nine o'clock and time for him to breakfast, he repeated the words distinctly, yet without understanding them. If, however, his servant put a watch into his hand, he said, Why, William, have I not my breakfast? On almost every occasion his servants conversed with him by visible objects, although his hearing was perfect.

RECAPITULATION.

In this chapter I have begun by examining the importance of the five external senses. I have next entered into several considerations which are applicable to every sense; as that each has two organs; that their impressions are double, but consciousness only single; that each performs its functions by its own energy and independently; that every sense may be exercised; that all their functions are modified; that the senses cannot produce their enjoyments; that their functions are immediate or mediate; and that each has only one kind of perception. In treating of the particularities of the five senses I have shown what must not be attributed to them, and have determined the sphere of activity of each.

CHAPTER II.

FUNCTIONS OF THE BRAIN.

I PROPOSE in the first place to examine the difference between the expressions, seat and organ of the soul. The seat of the soul, and the mutual influence of the soul on the body, and of the body on the soul, were formerly spoken of. To us these two problems seem to be beyond the reach of natural philosophy. It is absurd to assign a material seat to an immaterial being; and the action of an immaterial being upon the body, and that of the body upon an immaterial being, are quite inconceivable. I shall mention only a few of the opinions which have been entertained on this subject. Physiologists and philosophers, according to their opinions respecting the soul, assign to it a different seat, and a different manner of acting upon the body. From ancient times down to the present day, the moral sentiments have been attributed to the different viscera. The sentient soul, or intellectual faculties, on the contrary, was placed in the brain, according to Pythagoras, Plato, Galen, Haller and the greater number of physiologists. Yet Aristotle placed it in the heart, and Van Helmont in the stomach. Erasistratus, however, placed it in the cerebral membranes; Herophilus in the cavities of the brain; Des Cartes and his followers in the pineal gland (*Pl.* II. *fig.* 2. ε), Serveto in the aque-

duct of Sylvius (*Pl.* II. *fig.* 2. φ); Wharton and Schellhammer in the commencement of the spinal marrow; Drelincourt and others in the cerebellum (*Pl.* I. *fig.* 2. I.); Bontekoe, Lancisi and Lapeyronie in the great commissure of the brain; Willis in the corpora striata; Vieussens in the centrum ovale of the medullary substance; Soemmerring in the vapour of the cerebral cavities, &c. It is said, however, by some that each of these parts has been found wounded, diseased, and entirely disorganised without any alteration of the intellectual faculties; and hence it results, say they, that these parts are not the seat of the soul.

In order to explain the mutual influence of the soul and body, the most extravagant opinions have been formed. Some authors, with Malebranche, consider God as the immediate agent between the soul and the body. Others, on the contrary, deny the existence of two different beings, and consider all faculties as properties of the body which are propagated with the semen, and produced by the developement of the organization. A third class of writers endeavours to reconcile all the differences of opinion, by the intervention of some medium or middle substance. Hence the great number of vapours, fluids, pneumata and vital spirits: hence the introduction of caloric, and the electric, galvanic and magnetic, fluids. We shall ever adhere strictly to our first declaration—that we make no inquiries into the nature of the soul; we observe only its manifestations, and the organic conditions by means of which they take place; and, in speaking of organs, we speak only of the organic parts by

means of which the faculties of the soul become apparent.

Animal life begins with consciousness; and we must therefore first examine whether the whole body, or the brain alone, is the organ of this faculty. Many physiologists and philosophers dwell at much length on the subject of unity, both in inorganic and organic nature: they maintain that the whole contributes to the performance of every function, and that no part in an isolated state can perform its function. This manner of speaking is not sufficiently distinct. It is indeed true that no part can perform its function if its organization be not in a healthy and perfect state; thus the organization of the eyes must be perfect, otherwise the eyes cannot see, &c. All the parts, therefore, which contribute to the nutrition and reproduction of the organs contribute immediately to the function of every part; and in this manner the stomach and alimentary canal contribute to the functions of the brain. Still, however, peculiar functions are performed by peculiar organizations.

Now it is evident that all those parts which are insensible cannot be considered as organs of sensibility. It is even generally admitted that the functions of animal life are confined to the nervous system, and it is only undecided whether the whole nervous system, or only one part of it, is the organ of animal life. I consequently ask, Is consciousness manifested by the whole nervous system, or is it confined to certain parts of that system? The opinions of physiologists on this subject are different. The greater number consider the brain as, independently

of the spinal marrow and the nerves of the five external senses, the organ of all consciousness; and in support of this, they adduce the following proofs.—A nerve divided can no more produce either sensation or voluntary motion, however it may be irritated; and hence, the sentient principle does not reside in the nerves, or at the place where the impression is made, but only in the brain. If the origin or continuation of any nerve be compressed, its function is suspended, but after the pressure is removed, sensation returns; and hence, the consciousness of all impressions must reside in the brain. When the brain is compressed by any fluid, by a large excrescence, by turgid blood-vessels, or by a violent concussion, all sensation is interrupted; but it is restored in proportion as the compression is removed. Sometimes in convulsive fits, pains are felt as if ascending along the nerves to the brain; and such pains are often cured by dividing or by tying the nerves. After the amputation of a limb, some individuals, though perfectly cured, fancy that they feel pains in the amputated limb; and surely such pain cannot have its seat but in the brain. Finally, all volition comes from the brain; and consequently the first cause of all voluntary motion resides in it. The opinion that all consciousness resides in the brain was formerly supported also by the assertion that all nerves are continuations of the brain, and that they have in it a central point. This last proof, however, can no longer be admitted, since we have demonstrated, that neither the nerves of the external senses, nor

the spinal marrow, are prolongations of the cerebral mass; and that the nervous fibres are not even concentrated into one spot; but that every nervous system has its own origin, and that the different nervous systems are only brought into communication by nervous branches, and exert thereby a mutual influence.

OBJECTIONS.

On the other hand, arguments of various degrees of validity may be employed, in order to prove that the brain is not exclusively the organ of sensation and voluntary motion. Dumas thinks that those who have lost a limb, and imagine that they feel pain in it, do so by their power of recollection: but if that be the case, Dumas ought to prove that the power of recollection is different from that of consciousness, before he can conclude that that power may exist in the brain, and consciousness everywhere. Besides, why is it absolutely impossible to produce an equal degree of other agreeable or disagreeable sensations by means of the power of recollection? Moreover, after amputations, why are pains particularly excited by wet, stormy and changeable weather? Hence, the assertion of Dumas is far from refuting the positive proofs, that all consciousness belongs to the brain.

The same physiologist thinks that the brain can neither be the seat nor the organ of sensation, because it is insensible. It is true that the convolutions of the brain, when wounded or mutilated, do not produce the same pains as the sensitive nerves

do when they are injured. Yet in certain diseases the brain becomes very painful, as is the case with various other parts which do not manifest any sensibility in the healthy state. Besides, no one says that the pains which we feel in our limbs exist in the brain. The pains exist in the part where the impressions are made; and this organ has only the consciousness of them. Moreover, we must remember that the sensations of different parts are quite different, and that although one part does not produce the sensations similar to another, it cannot on that account be called insensible. The nerves of hunger and thirst cannot perceive the sensations of pride or compassion; and the olfactory nerve cannot perceive the impressions of light: but every particular sensation is manifested by means of a particular organization. Now thinking and willing certainly are sensations, and no one can or will deny that these two functions are confined to the brain: it therefore can only be said, that the brain does not manifest all kinds of sensation. The assertion, however, that all consciousness resides in the brain, is not yet refuted; and it may still be maintained that the nerves produce the impressions, but that the brain perceives them and alone has consciousness.

It is also objected that sometimes acephali, entirely destitute of cerebral substance, live, suck and produce various motions; and consequently that the brain cannot be the only organ of sensation. In this objection, however, automatic motions are evidently confounded with consciousness. This is also

the case, when they advance with Gautier the objection, that a beheaded cock struggles in order to fight and to defend itself. All such phenomena observed in insects, fishes, reptiles, birds, quadrupeds and even in man, are the result of irritability without consciousness. Such motions seem to be accompanied by sensation and will, only because from the organic structure and mechanical arrangement of the parts, the motions take place in the same way as they would do if they were determined by the will and were accompanied by consciousness. There are however many phenomena which happen according to determinate laws without consciousness, reflection, or will. In this way, the motions of the muscles are determined, whether they are the effect of the will or of any other excitement. All automatic motions take place independently of a brain, and neither the energy nor the length of automatic life is in proportion to the quantity of brain. During sleep and before birth, automatic motions exist in sufficient perfection, yet the animal functions are then inactive.

It is not even determined whether the crying and sucking of the infant are always accompanied by consciousness, or whether these phenomena may belong to automatic life. It appears to me that they are sometimes automatic and at other times animal, just as motions in general are. It therefore must be remembered that certain parts of the body can produce only automatic motions, while other parts are subjected to the will, but that these are nevertheless capable of producing motions which are not the

result of the will, though they are still conformable to the structure of the muscles.

Duverney is said to have removed the brain entirely from some pigeons, which yet continued to perform all the animal functions. Similar experiments on turtles are mentioned by several authors, who acknowledge however, that their knowledge of these facts was derived merely from hearsay. It is evident to us that the whole brain cannot be removed without destroying at the same time the nerves of the external senses, and even the animals themselves. Besides it is generally known that some sportsmen kill wounded birds by driving a feather into their neck. In order however to be absolutely certain of this, I made several experiments. I cut off the greatest portion of the hemispheres of the brain of some hens and pigeons, even the great commissure, and the cerebral substance down as far as the lateral or rather the great ventricles; and yet these animals still manifested distinctly the senses of seeing and hearing. They did not indeed take the food presented to them, but they swallowed bread and seed when introduced into their bills. Rabbits, mutilated in the same manner, walked, saw and heard; and even took food spontaneously. It is, therefore, certain that the destruction of all the superior parts of the brain does not destroy the functions of the five senses and the muscular motion. It is, however, impossible to remove all the cerebral mass without killing the animals: as soon as the corpora striata and optic thalami were wounded, convulsions and death succeeded. Hence we declare that the expe-

riments made by Duverney are entirely false. All that can be concluded from them is, that the whole brain is not necessary to the functions of the five senses; but it cannot be concluded that no cerebral part is necessary to these functions, because it is impossible to separate the brain from the nerves of the five senses without killing the animals.

There are other arguments which give us reason to suppose that the external senses have perception. There are animals to which it is impossible to refuse feeling and taste, although they present nothing which may be compared to any portion of the brain. Now every nerve destined to a particular function has its own origin, its gradual enlargement, its proper expansion, its particular form, and it forms a whole in respect to its *structure*: why relatively to its *function* should it not make a whole? The functions moreover of the nervous systems of the five senses are in proportion to the perfection of their particular organization, and by no means to the quantity of the brain. Several insects also, notwithstanding the extreme smallness of their brain, are endowed with an extraordinary fine feeling, taste and smell: eagles, though possessing little brain, see more acutely than dogs, whose brain is much larger; and the smell of dogs is more acute than that of man, whose brain is so very considerable. It has been likewise observed that when not only the external apparatus, but also the internal organization of a sense is destroyed, all the ideas which belong to this sense are lost or annihilated. It must however be granted that even these argu-

ments are insufficient to explain why, in perfect animals, every nerve which is pressed, tied, or divided, loses sensation. Perhaps, in perfect animals, the inferior parts of the brain are as necessary to consciousness as the heart is necessary to the circulation of the blood; while in lower animals a kind of obscure consciousness exists independent of the brain, just as in them, and even in plants, circulation takes place without a heart.

After every consideration it remains undecided, at least in perfect animals, in what respect the brain is necessary to the passive consciousness of the external senses. It is, however, certain, that the will, and consequently the *voluntary* motions and reflection, depend on the brain? for no phenomena of this kind take place without a brain. Thus it is necessary to distinguish the regular motions into those which are regular but only automatic, and into those which are both regular and voluntary: the latter depend on the actions of the brain; the former take place without it. It is similarly necessary to make distinctions respecting the functions of the five external senses. It is undecided whether their passive consciousness takes place by the assistance of the brain, or by means of their respective nerves alone; but it is certain that their active consciousness, accompanied by attention, reflection and will, can be effected only by the operation of the brain.

THE BRAIN IS THE ORGAN OF THE MIND.

For many centuries it has been said the brain is the organ of the soul; and hence some may think it superfluous to enter into any detailed argument in support of this truth. There still however exist many doubts to be resolved, many difficulties to be removed, and many notions to be fixed with greater precision. The repetition, moreover, of transitory and contradictory opinions is a thing quite different from the accurate knowledge of an object in all its details.

If, according to the ancient philosophers, the intellectual faculties be placed in the brain, and the moral sentiments in the viscera of the abdomen and thorax for the purpose of preventing the understanding from being disturbed by the passions;—if it be said that the nervous plexus or ganglia are the seats of the affections;—if, according to Dumas, Richerand, Sprengel and other physiologists, the difference of the feelings and intellectual faculties result from the difference of the temperaments;—if Pinel and others do not dare to seek in the brain the proximate causes of mental alienation;—if Bichat consider the hemispheres of the brain as mere coverings of the internal parts;—if, according to Sabatier and Boyer, the brain be a secreting organ, and, according to all anatomists before us, the origin and source of the nerves;—if all the sensations and ideas be derived from the five external senses;—if the instinctive labours of animals, and the arts of man, be ascribable to their hands, eyes,

ears and other external instruments :—if it be maintained that one nerve can perform the function of another nerve, so that the nerves are homogeneous; —if it be taught by some magnetisers, that, in the perfect state of animal magnetism, the spirit acts without the assistance of the organization;—if the soul of the world be spoken of and admitted;—if the greater number of metaphysicians maintain that the highest faculties of the understanding, reason and will at least, act independently of all the organization :—if hydrocephalic persons be mentioned as having without brain manifested moral sentiments and intellectual faculties;—if the same be related of animals whose brain was ossified;—if, in short, any of these assertions be admitted, and if it be at the same time maintained that the brain is exclusively the organ of the soul, the contradiction is certainly evident. Now there is no author who has not advanced one or other of these suppositions; and therefore it is not superfluous to detail our ideas relative to the organ of the soul, and to inculcate our principle that the brain is exclusively the organ of the feelings and the intellectual faculties.

In support of this truth I accordingly make the following observations.———All the parts of the body may be wounded or destroyed—even the nervous mass of the spine may be compressed or injured at a certain distance from the brain, without immediately destroying the feelings and intellectual faculties. In tetanus, produced by a cause remote from the brain, the other nervous systems are attacked in the most violent manner, while the functions of the

mind remain sometimes till death. On the contrary, if the brain be compressed or destroyed, its functions are deranged, and the manifestations of the feelings and intellectual faculties are suspended or annihilated. Moreover, automatic life requires neither brain nor cerebellum. The superior parts, therefore, of both hemispheres, the great commissure, even more than half the cerebellum, may be wounded, destroyed by suppuration, diminished in size, or entirely removed, without destroying the functions of the five external senses and automatic life; and several acephali, or monsters destitute of the brain, are born strong and fat, and some of them even live during some time after birth. Hence if the brain were not destined for superior functions, its existence would be altogether useless. It is more than probable however that the most perfect of all the nervous systems has also an object corresponding to its organization.

Moreover, however defective our knowledge of the scale of the brain from the lowest animals to man may be, it is yet certain that the number of the faculties increases in proportion to the multiplication of the cerebral parts. This increased number of the feelings and intellectual faculties of man, and of the instinctive labours of animals, is neither in proportion to the five external senses, nor to any other part of the body, but solely to the cerebral parts. Now this could not happen if the brain were not exclusively the organ of the feelings and intellectual faculties.

Again, if the developement of the brain be defec-

tive, the manifestations of the feelings and intellectual faculties are also defective. Accordingly, an infinite number of observations prove that the brains of idiots from birth are defective; and that the manifestations of the feelings and intellectual faculties improve and become perfect in the same proportion as the organization of the brain improves. On the contrary, if the developement of the brain be very considerable, the manifestations of the feelings and intellectual faculties are very energetic. Let the observer, then, consider the heads of those who have excelled in capacity and talent; bearing however in mind the difference between a large brain and a large face; for the brain may be small and the face large, or the brain large and the face small. Indeed, the manifestations of the faculties follow the ordinary or extraordinary growth of the organs: in children the brain is yet pulpy, and therefore the functions of animal life cannot be manifested; but in proportion as the brain increases, the faculties manifest themselves; in the state of maturity, the brain has acquired the highest degree of developement, and the manifestations the greatest energy; and in proportion as the organization of the brain decreases, the energy of the moral sentiments and of the intellectual faculties decreases also.

If moreover the developement of the brain do not follow the common order—if it take place too early or too late, the manifestations of the moral sentiments and intellectual faculties are subjected to precisely similar changes. Certain faculties, also,

are more active in men, and others in women, according to the difference of their cerebral organization. The feelings and intellectual faculties are even hereditary in the same degree in which the organization of the brain is hereditary or is propagated from parents to children. Hence, as there is a proportion between the developement, increase and decrease of the brain, and the manifestations of the moral sentiments and intellectual faculties, we cannot avoid the conclusion that the brain is the organ of these faculties.

To the preceding proofs I may add, that the moral sentiments and intellectual faculties are weakened or deranged either by age or disease, in the same proportion as the brain is altered. Finally, every one feels that he thinks by means of his brain. Thus every thing concurs to prove that the brain must be considered as the organ of the moral sentiments and intellectual faculties. When, therefore, we say, that the brain is the organ of the mind, our meaning is different from that of other physiologists, since we consider the brain as the organ both of the moral feelings, and of the intellectual faculties, while they look to it for organs only of the latter.

OBJECTIONS.

There are, however, various objections against the assertion that the brain is exclusively the organ of the moral sentiments and intellectual faculties. I shall answer the most important of them which are still repeated in different writings.

I. Viscera.

The greater number of physiologists, physicians and philosophers derive the moral sentiments from various viscera, or from the nervous plexus and ganglia of the great sympathetic nerve; that is, from the nerves of the abdomen and thorax; but comparative anatomy and physiology entirely contradict this opinion. There are animals, which are endowed with faculties attributed to certain bowels or viscera, which absolutely do not possess these viscera. Insects, for instance, become angry, and have neither liver nor bile. Oxen, horses, hogs &c. have many viscera in structure analogous to those of man, and yet they want many faculties which are attributed to these viscera, and with which man is endowed. There is also no proportion either in animals or in man between the size of the viscera or even of the ganglions, and the moral sentiments ascribed to them. Several viscera, nervous plexus and ganglia are likewise greater in animals than in man, and yet the qualities attributed to them are beyond all doubt more energetic in man. There is no proportion between the number of viscera and that of moral sentiments in different animals. The four-footed animals, moreover, have very similar viscera and nervous ganglia, as the dog, wild boar, ox, horse, sheep, beaver, hare, roe, wolf, tiger, lion &c., yet their inclinations are entirely different, and in some cases even opposite. The heart of the tiger, however, ought to be the organ of cruelty, and the heart of a lamb that of meekness! Farther,

there is no proportion between the period of the developement of the viscera and the manifestations of the moral sentiments. In young animals and in children several viscera are sooner developed than the inclinations ascribed to them are manifested: at least they are not manifested in the same proportion. It is then astonishing that Bichat should derive all passions from organic life, as he believed that organic life was perfect in new-born children, and yet that children have no passions. Those who, with Reil, maintain that the nervous plexus and ganglia are the organs of the affections and passions, and who say that the ganglia are destined to weaken or interrupt the propagation of internal impressions to the brain, fall into a similar contradiction; for affections and passions make powerful impressions, and their energy does reach the brain, and is felt both in animals and in man. Moreover, it is a principle that every organic part manifests only *one particular* function. Now each viscus has its particular function which is known and conformable to its structure. Hence viscera cannot manifest the moral sentiments.

In respect to man, it may be added, that acephali and complete idiots have viscera and ganglia, and a very energetic assimilating power; and that yet they manifest no moral sentiment. In man also there is no constant proportion between the energy of the moral sentiments and the activity of the viscera. Finally, the moral sentiments are not subjected to derangements proportionate to the diseases of the viscera. The frequency of the pulse does

not produce pride, attachment, compassion &c. From all these proofs, we infer that the viscera do not produce the moral sentiments.

It is replied that man, when he is influenced by any great affection or passion, as by anger, jealousy, fear &c., feels evidently some motion in the viscera: and that it is therefore natural to suppose that those affections reside in these parts. It may however in general be answered, that from the sensations or other phenomena, which take place in various parts of the body, it is impossible to infer that the primitive cause of these phenomena resides in the parts which suffer these changes. All parts are in communication with, and exercise an influence upon, each other. In this way, the great sympathetic nerve, or the nerves of the abdomen and thorax, are connected with the spinal marrow, with the nerves of the external senses, and with the brain. Without this communication, animal life would be confined to the brain, and this organ could not excite the instruments necessary to motion. Now the activity of one part produces various phenomena in other parts; and as the existence of pain and pleasure does not demonstrate that their consciousness resides at the place where we feel the irritation, so the mutual influence of these parts does not demonstrate that the affections have their seat in the thorax or abdomen, where we may feel consentaneous motions. Sorrow makes the tears to flow, and anger makes the knees to tremble, and the lips to quiver: but who would therefore assert that sorrow resides in the lachrymal gland, and anger in the knees and lips!

When wounds of the brain produce contractions of the gall bladder, overflowing of the bile and vomiting, the primitive cause resides in the brain: but no one will place there the overflowing of the gall and the consequent vomiting. Indigestible aliments introduced into the stomach produce headach; and intestinal worms, narcotics and similar extraneous bodies sometimes produce madness, blindness &c.: but who will therefore maintain that madness, blindness &c. have their seat in the alimentary canal? The remembrance of an injury acts upon the heart, and augments the pulsation: but is the brain therefore the organ of the circulation? It follows therefore, from these and similar considerations, that from the sensations which are produced in different parts by affections and passions, it is impossible to infer that these parts are their respective organs.

All that has been said, in order to prove that the abdominal and thoracic viscera are not the organs of the moral sentiments, may be applied also to the nervous plexus and ganglia of the abdomen and thorax. These nervous systems are essentially necessary to the performance of the functions of automatic or organic life.

Moreover all the proofs advanced above against the viscera being the organs of the feelings, serve also to show that the nerves of the vertebral column do not manifest either the moral sentiments, or the intellectual faculties. Neither the number of these nerves, nor the period of their developement, nor their greater or less degree of perfection, have any

relation to these faculties. The nerves of the spine, on the contrary, produce muscular motion and the sense of feeling.

II. Diseases and Wounds of the Brain.

In order to prove that the brain is exclusively the organ of the mind, I have observed that its functions are more or less disturbed by the diseases and wounds of the brain. Hildanus relates that the skull of a boy, ten years of age, was by an accident depressed near the lambdoid suture; and as no harm immediately resulted from it, the bone was not lifted up. The boy, however, who was endowed with strong mental dispositions, by degrees lost memory and judgment; became incapable of learning any thing; and finished by becoming an idiot, living till forty years of age. Repeated observations induced also Boerhaave to say, that if the bones of the skull be depressed, and compress the brain, numbness of the senses, fainting, giddiness, want of consciousness and delirium, result from it. In the writings too of Morgagni, Haller and others, many slight injuries of the brain are quoted, by which the faculties of the mind were disturbed. It seems superfluous to quote a greater number of such examples. Several authors have even maintained that every injury of the brain necessarily produces some derangement of the functions of the mind.

On the other hand, many observations have been published according to which the most considerable injuries of the brain have not impaired the manifes-

tations of the mind. Thus a person was wounded in the head by a shot; the ball remained in the brain; and after the death of this person the ball was found near the pineal gland: yet this man lived several years after the accident without manifesting the least derangement of the intellectual faculties.* The skull of a child of eight years of age was broken by the kick of a horse; and bits of the cineritious substance, larger than a hen's egg (as it is expressed), came out and were lost: yet this child was perfectly cured, and his intellectual faculties did not suffer.† A person, fifteen years of age, received a blow on the head with a stone; his brain became black, and issued out of the wound; and, in a fit of delirium, he with violence pulled away the apparatus which covered the wound, and with it a considerable portion of the injured brain: the cerebral substance was consequently injured down to the corpus callosum; and the patient was paralysed; but his intelligence was not impaired.‡ A child seven years of age had a severe wound on his head by a fall from a horse; and the brain issued continually by new excrescences, without doing any harm to the intellectual faculties, though the ulceration penetrated to the cerebral substance. Another child lost a great deal of his brain by fungus, which grew during four months: and the cineritious substance, entirely destroyed at the place of the wound, was changed into purulent matter: yet the child preserved consciousness, and spoke with under-

* Memoires de l'Acad. de Chir. tom. i. p. 134.

† Ibid. p. 126. ‡ Ibid. p. 150.

standing till his death.* A stag drove its horn through the orbit into the head of a hunter, so that the end of the horn came out at the top of the hunter's head; and notwithstanding this accident the hunter walked home two leagues on foot. A great number of similar cases have been noted, partly as extraordinary observations, and partly in order to prove that the brain is not the organ of the mind, and that the functions of the intellectual faculties are independent of the organization.

There are still more numerous examples of derangement in the intellectual faculties, while not the least defect could be discovered in the brain. Indeed, in many cases of mental alienation, instead of finding out any cause in the brain, an evidently diseased state has been observed in quite different parts, as in the liver, bowels &c. Hence Pinel affirms that the most exact dissections have not taught any thing in respect to the seat of mental alienation, and that we have from the diseases of the brain no sufficient data to conclude that the brain is exclusively the organ of the intellectual faculties.

In order to correct these facts, opposite in appearance, we must consider two questions: Was it, before the present time, possible to judge accurately of diseases and wounds of the brain in respect to their nature? And was it, before the present time, possible to judge correctly of the effects produced by them in the manifestations of the intellectual

* Van Swieten, tom. i. p. 440.

faculties? It was evidently impossible to make exact anatomical observations upon an organization which was not only unknown, but in respect to which were entertained notions, not only quite erroneous, but entirely opposite to its real structure; and it is beyond doubt that this hitherto was the case with the internal structure of the brain. Moreover, the authority of writers induces too often the admission of facts which never had existence. Morgagni, for instance, maintains that the brains of those who are proud and stubborn are hard and coriaceous; and that the brains of those who have a meek, unsteady and undecided character are soft. Theophilus Bonnet relates that the brains of some who died of anger and fury were hard, dry and friable. According to the opinion of Portal, in fools the convolutions of the brain are less deep: according to Dumas, in reasonable men the form of the brain is round: this author advances also that the character of any person is mild or hasty; that his ideas are lively and rational, or heavy and confused; that he is an idiot or a fool, according as his brain is more or less of a dark colour, more or less firm, &c. Though, however, such exaggerated notions are ill-founded, can it be right to conclude that in madness and idiotism the organ of the mind undergoes no kind of derangement? Hence it seems necessary to inquire what changes can take place in the cerebral mass in general, or in any of its particular parts; and it is also necessary to consider whether any derangement may happen which cannot be observed by the five external senses? If any one die by being

struck by a thunderbolt, or in consequence of the gout in the stomach, or of hydrophobia, or of tetanus, no derangement is discovered in the nervous system: are we therefore authorised to say that the nervous system has not in these cases suffered any change?

In the same way, certain alterations of the brain are not visible if they be transitory, but they become manifest after a lapse of time. The blood-vessels are then sometimes found ossified; and sometimes a great quantity of bony substance is deposited on the internal surface of the skull, and the cerebral mass itself is diminished in size.

We are of opinion that all the derangements of the manifestations of the mind result immediately from a change in the brain. We admit that the remote causes of mental diseases often reside in the viscera of the abdomen; but does it follow that their immediate cause is not in the brain? Intestinal worms produce, by their irritations of the bowels, a bad breath, cough, grinding of teeth, tickling in the nose, blindness, madness, &c. but the bowels are no more the seat of the madness than they are the seat of the gnashing of the teeth, of the tickling of the nose, or of the blindness. There exists, then, an influence of the viscera upon the brain, and *vice versâ*; and therefore the functions of the brain may be deranged by the influence of parts so remote. It is, however, conceivable that a derangement of the brain, which at the beginning is only sympathetic, may continue after the first cause no longer

exists, that is, if the first cause have produced an alteration in the cerebral mass. On account of the reciprocal influence of the brain and the viscera of the abdomen, many derangements of the functions of the viscera result from different affections of the brain: thus, fear relaxes the bowels, grief troubles digestion, anger deranges the secretion of bile, &c. And as a derangement of the viscera may thus produce a derangement of the functions of the brain, which may still augment the disease of the viscera; so a derangement of the functions of a viscus may result from certain moral sentiments, and may reciprocally augment the disease of the brain.

It is also true that very considerable injuries of the brain produce sometimes very slight perturbations in the manifestations of the mind; and that on the contrary very slight injuries of the brain are accompanied often with the most violent symptoms. This, however, happens also in other parts of the body. Very considerable abscesses are sometimes found in the lungs without a considerable preceding derangement of the respiration: are not the lungs therefore the organ of respiration? Ossifications have sometimes been observed in the heart, without any remarkable disturbance of the circulation: is not the heart, therefore, the organ of circulation? Hence evidently, it is wrong to attribute to the wound, or to its seat, what can be attributed only to the particular irritability of the patient. Thus may we explain why often no bad symptom results from a very considerable wound of the brain, namely, this

occurs only in patients whose irritability is very weak; for in very irritable persons very slight wounds produce the most serious consequences.

It remains for me to mention certain statements that half the brain has been completely destroyed by suppuration, while the manifestations of the intellectual faculties have remained. Now it seems that in such a case the half, at least, of the manifestations ought to be annihilated. Though, however, these observations seem to be incorrect, let us admit them as they are related: let us even join to them an observation made by Gall at Vienna. He attended a clergyman in the Theresian Institution, who for a long time had a postular erisypelas, which disappeared and re-appeared from time to time: his left side became weaker by degrees, so that at last he could not walk without a stick: and finally, he was struck with apoplexy and died in a few hours:—three days before, he had preached and delivered a lecture at the school. On the dissection of his head, the middle part of the right hemisphere, as large as one's hand, was found changed into a yellowish and grumous substance. Gall, however, regrets his not then knowing the structure of the brain, and being prevented from making exact observations of it. It is however certain, that notwithstanding this considerable alteration of the hemisphere, the intellectual faculties of this individual manifested themselves with surprising regularity. It remains, therefore, to be examined how such observations are to be explained, if the brain be the organ of the mind.

In this objection, and, generally, in all injuries of the brain, the duplicity of the nervous systems has been forgotten. One half, however, of the brain may be destroyed, and the other half still continue to exert the manifestations of the mind. One of the optic, auditory, olfactory, or other nerves may be destroyed, while the other manifests its function. In the same manner, one side of the brain, or one hemisphere may be destroyed, while the other hemisphere continues to manifest the faculties of the mind. Now it is evident that both hemispheres of the brain may be in a quite different or even opposite state. Tiedeman relates the example of one Moser, who was insane on one side, and who observed his insanity with the other. Gall attended a minister who, having a similar disease for three years, heard constantly on his left side reproaches and injuries; and turned his head to that side in order to look at the persons: with his right side he commonly judged of the madness of his left side; but sometimes in a fit of fever he could not rectify his peculiar state: long after being cured, if he happened to be angry, or if he had drunk more than he was accustomed to do, he observed in his left side a tendency to his former alienation.

These observations seem to be extraordinary; but the opposite state of both hemispheres is not rare. It exists evidently in the hemiplegia, wherein one hemisphere is paralysed and deprived of activity, while the other continues to exert its functions, so that the patients do not seem to have lost any faculty of the mind. One half of the tongue is then

paralysed, one eye is blind, one ear deaf; while the taste remains, the other eye sees, and the other ear hears. Sometimes one hemisphere of the brain is inflamed, and the other not. In the megrim, the blood-vessels are more full on the diseased side. A child died by a violent blow applied to the right side of the head: on dissection that side was found quite pale and bloodless, and the left, on the contrary, was injected and loaded with blood—an evident proof that the hemispheres may be in an opposite state: if this child had continued to live, he would have been paralysed on one side, and he would have suffered violent convulsions on the other. I dissected the brain of a mad girl, and found that on the left side much of the inferior large apparatus of increase (thalamus) was destroyed by ulceration; and that the nervous bundles were diminished in size, and the convolutions proportionate; while on the right side all the parts were larger. Thus, as it is proved that all the cerebral parts are double, and that one half may be in a different state from the other; it may easily be conceived that any special faculty may manifest itself, as long as the respective organ is not utterly destroyed on both sides.

Let us examine whether it was hitherto possible to judge correctly of the derangement of the manifestations of the mind. No one more sensibly feels the insufficiency of the actual state of our knowledge of human nature, than those who observe the derangements of the manifestations of the mind. Pinel despairs of our ever being able to know the

cause of mental derangement, on account of our ignorance of its healthy state. I shall here limit my observations to the exposure of the defectiveness of the proceedings of our predecessors.

All reports relative to wounds of the head, and the injuries of the brain, while the manifestations of the mind were preserved, are confined to the following expressions:—The patient continued to walk, to eat and drink; he had his consciousness entire, *viz.* he knew all around him; he manifested some memory and judgment; and consequently he possessed all the faculties of the mind, and none of them was disturbed. If, however, a person of a mild and peaceable character, after being wounded on the brain by a stone, become quarrelsome and morose; and if another, whose actions were irreproachable, after being wounded on the head, feel an irresistible inclination to steal; it is indeed evident that these persons have preserved consciousness, memory, judgment and imagination; but can we thence infer that the injury of the brain has not produced any derangement of the manifestations of the mind? Moreover, animals have consciousness, memory and judgment; are they therefore men? If the faculties of a man were by any disease reduced to the level of those of a dog, and preserve the functions of the five external senses, as well as some degree of memory and judgment, would he therefore have lost no characteristic faculty of humanity? If partial idiots have perception, memory and judgment, do therefore all their faculties manifest themselves? If in partial madness the patients pre-

serve consciousness, memory and judgment; and if their imagination be even exalted; are therefore all their faculties unimpaired? Finally, if persons by a concussion of the brain, or by a fit of apoplexy, lose the memory of proper names, or of a language, and if they preserve the functions of the five senses, memory and judgment, have they therefore lost nothing at all? Thus it is evident that now the manifestations of this, and then of that faculty of the mind may be deranged or destroyed, though the patient is incorrectly said to preserve the faculties which constitute the whole intellectual being. It follows also that it has hitherto been impossible to judge accurately of the effects of diseases and injuries of the brain, because all physiologists considered only the general attributes of the understanding, and were quite ignorant with regard to the special faculties. Hence, inquiries into the injuries of the brain, in respect to mental alienation, must be made with more exactness than it has hitherto been possible to make them.

III. Hydrocephalus.

An objection has been founded on pretended observations, according to which, although the brain was destroyed, dissolved, or disorganized by water, yet the manifestations of the mind continued unimpaired. Zacutus Lusitanus accordingly maintains that he saw a child who lived for three years without brain; and he believes that he found in this child a double dura mater. Duverney says that he

found in one head only water and no brain. Haller and Soemmerring speak of these observations without denying them. Lauffer * speaks of a new-born child in whose head he found no brain, but only water; and he maintains that the brain once existed, and was afterwards dissolved by the water. This opinion was at one time very general, and the phenomenon is spoken of under the name liquefaction, or dissolution of the brain.

Now, anatomists were accustomed to see the brain presenting a thick and solid mass in its natural state; and if they did not find this solid mass, they considered the brain as dissolved or annihilated. Morgagni, however, reproached Duverney with his inadvertency; he assured us that, in perfectly similar cases, he has always found the brain only distended into a thin membrane; and he relates that the same has been observed before him by Tulpius, Vesalius and several other anatomists. In order correctly to answer this objection, we must consider three points. First it is to be examined, where the water is found; then, what change the cerebral mass has undergone; and lastly, what change had taken place in the manifestations of the faculties of the mind.

Sir Everard Home, in his Observations on the Functions of the Brain; † seems to maintain that there is a certain quantity of water in all brains. He even says: " Facts appear to point out the use

* Diss. de Infante sine Cerebro nato Halae, 1743.

† Loc. Cit. p. 471.

of the water in the ventricles in the brain, and they account for the great variety which is met with in the form and extent of the posterior cornua, of the lateral ventricles, their size varying according to the quantity of water which is necessary to keep up the pressure required." He says, "Pressure to a certain degree, uniformly kept up, is necessary for the performance of the healthy functions of the cerebrum, and any increase or diminution of this pressure puts a stop to them." This reasoning is founded on the observation, that often large hydrocephalic heads continue to perform the functions of the brain.

It is certainly true, that the cavities of the brain vary according to the quantity of collected water. They are, however, very different in the natural state, when no water is contained in them. It is, however, quite incontestable that water is either the effect of disease, or is collected after death; for in animals which are killed, or in men who die suddenly by a violent external cause, no water is ever found in the ventricles.

Physicians, however, are not agreed where the water is contained in hydrocephalic persons. I speak here only of those whose skull is distended beyond the natural size; for there are two other varieties of this disease, which are very important in the practice of medicine, but which do not belong to this subject. Dr. Baillie, in his Morbid Anatomy, in treating of the symptoms of hydrocephalus, has entirely neglected this difference. Sir Everard Home, in his Observations on the Functions of the

Brain,* also confounds the chronic and acute hydrocephalus. He thinks that "the quantity of water may be much increased without material injury to the functions of the brain, when the skull is not ossified; but after that period, even a few ounces in the lateral ventricles have been known to produce as much undue pressure, as to bring on headache, general uneasiness, a sensation as if the head were too large, loss of spirits, convulsions, loss of memory of recent events, idiotism, insensibility and death." Now all the cases which he here states are of an acute nature; and ought to be distinguished from those of the chronic hydrocephalus. The acute dropsy of the brain is an effect of another disease; but the chronic hydrocephalus constitutes a peculiar morbid state.

In those hydrocephalic persons, whose skulls are larger than natural, the water is said to be accumulated either in the cavities of the brain, or between the membranes, or between the dura mater and the skull. While the greater number of practitioners consider the two latter cases as the most common, all physicians admit these three kinds. Professor Walter, at Berlin, has publicly maintained, that in sixteen hydrocephalic persons he always found the water external to the brain. Pinel* says that in hydrocephalic persons the water is contained between the skull and the dura mater, or between the membranes, and only sometimes in the cavities of

* Phil. Trans. Part. II. 1814, p. 474.

† Nosographie Phil. Edit. 3me. tom. iii. p. 423.

the brain. Odier fancies that the hydrocephalus is always produced in the windings of the pia mater: he distinguishes this hydrocephalus from the acute, which, in his opinion, is formed only by an accumulation in the ventricles: and he gives a detailed description of the acute hydrocephalus, calling it internal, in opposition to the hydrocephalus of which I here speak, and which is called external by Odier. Petit, on the contrary, maintains that in all distended hydrocephalic heads he found the water in the ventricles, and never between the membranes, nor between the dura mater and the skull. Our observations agree precisely with those of Petit. We maintain that in all hydrocephalic persons, whose skulls are extraordinarily distended and consequently contain a great accumulation of water, the liquid occupies the cavities of the brain.

We have, moreover, elsewhere proved that Walter has advanced his assertion only in order to support his erroneous opinion as to hydrocephalus, and that he has not opened any one of the sixteen skulls alluded to. In his defence, he even allows that nine of these heads were not in a state to be examined: the tenth was opened by professor Buttner at Königsberg. In his work, called *Museum*, Walter makes no mention of these skulls; and in his very considerable Collection we found not one dissected skull of hydrocephalus, while there were several unopened ones. It may easily be explained how anatomists and physicians have been led into this mistake. In those hydrocephalic skulls which contain a large quantity of water, the hemispheres of the brain are so much unfolded, that the brain is

distended like a bladder, being not more than a line in thickness: in sawing the skull without due caution, this thin membrane of cerebral matter is commonly wounded; the water which distended the brain issues; and the brain sinks down: the water then flows out; and if the superior part of the skull be taken away, the water even appears on the surface of the brain. Some physicians, indeed, of little experience, did not consider this membrane of cerebral matter as brain, but fancied that the brain had been dissolved by the water. There were even some who said that the brain had been compressed into a small mass, that is, they considered the inferior parts as the whole brain.

Now when the hydrocephalus of the cavities is confounded with an accumulation of water external to the brain; and when, according to the advice of Darwin,* an aperture is made in the skull to form an outlet for the water, the patient is sometimes killed suddenly, and sometimes dies in a few days. Some fluctuation, however, felt at the fontanel might easily deceive inaccurate observers; for sometimes the skull of children remains very thin; at different places the ossification takes place very late in life; and at certain points a membranous, or at most a cartilaginous, transparent layer alone covers the brain. It is necessary to be perfectly acquainted with these observations in order not to be deceived. Not long ago, Dr. Martin, junior,† endeavoured to cure this disease by puncture; but after seven days

* Zoology, vol. iii. p. 162, 236.

† Bulletin de la Societé d'Emulation de Paris, 1810, Mai, tom. v. p. 294.

the patient died: he erred solely from thinking that the water was accumulated between the brain and membranes.

Let us now examine what change the brain undergoes in dropsy of the cerebral cavities. It has by many anatomists been admitted that, in hydrocephalus of the cavities, the brain was distended like a bladder; but it was unknown in what this distension consisted; and it seemed inconceivable how a medullary substance could be distended to such thinness without breaking. Walter at Berlin, Ackermann at Heidelberg, and many others, do indeed admit the existence of the cerebral mass in hydrocephalic persons; but they maintain that this mass is destroyed or disorganized. We maintain that the cerebral substance is not disorganized; and we establish our assertion by anatomical and physiological proofs.

It may be proved by anatomy, that the fibres of the brain are directed vertically or perpendicularly upward from the cerebral cavities, and that every convolution consists of two layers applied one to another, and separable from each other. If, therefore, a great quantity of water be accumulated in the cerebral cavities, and act against the convolutions placed around these cavities, it gradually separates the two layers, whose natural position is vertical, till at last their situation is horizontal. In this manner, in large hydrocephalic skulls, the convolutions are entirely unfolded, and present a smooth surface and a membranous expansion.

This expansion was considered by Zacutus Lusitanus as a second dura mater. If, however, such a

hydrocephalic head have not been shaken, and if the opening have been made with due caution, the water is limpid. But if such heads be carried from one place to another, and thereby shaken, it is not astonishing that the water should be turbid, and the brain dissolved or eroded in appearance, and swimming in flakes in the fluid.

We establish our assertions also by physiology. If the brain be the organ of the soul, and if at the same time the cerebral substance be destroyed in hydrocephalic persons, it must be impossible for these persons to manifest any intellectual faculties. One, indeed, of the two following assertions must be maintained: either that the brain is the organ of the soul, and in this case it cannot be destroyed in those hydrocephalic persons who manifest intellectual faculties; or that the brain is not the organ of the soul, because hydrocephalic persons, whose brain is disorganized, nevertheless manifest feelings and intellectual faculties.

Walter, at Berlin, imagined that the brain of hydrocephalic persons was disorganized; and he therefore maintained that in them all the intellectual faculties were annihilated. There are, however, many instances, in which, although the disease is very considerable, there is still a manifestation of intellectual faculties. Tulpius had observed such a person endowed with understanding; and from this observation he inferred that the structure of the brain must be quite different from what it is supposed to be. Camper and many other anatomists, also, speak with amazement of similar cases.

In order to adduce yet stronger proofs against

those who deny that the brain is exclusively the organ of the soul, and to refute at the same time those who deny that hydrocephalic persons continue to manifest intellectual faculties, I shall quote several cases of this kind. We observed for some years a woman with a considerable dropsy of the brain, who manifested a moderate understanding like other women of her class; she died at fifty-four years of age of an intestinal inflammation: and the cavities of her brain contained nearly four pounds of limpid water. We have seen a learned man, whose head is extraordinarily high at the anterior superior part of the forehead, and which, if we may judge from its size, must contain from three to four pounds of water; yet this man has extensive knowledge: the only inconvenience which results from his peculiar state is, that in the midst of the most interesting conversation he often falls suddenly asleep, at table, at the theatre, and elsewhere. At Copenhagen, we saw a girl thirteen years of age, whose head was twenty-five inches in circumference, nineteen inches from one ear to the other, and the same measure from the root of the nose to the neck; her head must have contained from ten to thirteen pounds of water; and her legs were almost paralytic, so that she had to be carried from one place to another: yet she was genteel in her manners, and learned very well what other girls learned at school. At Augsbourg, we met with a girl thirteen years of age, whose head presented the same shape and size with that of the woman of fifty-four years mentioned above: this girl was little; but she walked

well; and she spoke with understanding. A similar girl, eleven years of age, was shown to us at Marbourg. At Bruchsal, we found a hydrocephalic girl of fourteen years of age, who was obliged to lie constantly in bed, and was certainly too childish for her age, but who nevertheless talked with understanding enough of every thing she was interested in. At Leipzic, Dr. Tobias showed us a hydrocephalic head of an extraordinary size: this person had lived thirty-six years, and possessed common understanding, which, however, he lost one year before his death by a violent fit of anger. Messrs. Laumeyer and Nueffer, at Fribourg in Brisgau, preserve the skeleton of a girl seven years of age, whose skull contained seventy ounces of water, and who was nevertheless able to remind other persons of news she had heard read in the papers some time before. Dr. Maler, of Carlsruhe, related to us the history of a person affected with hydrocephalus, who died at twenty years of age, and whose skull contained above ten pounds of water: this patient manifested an ordinary state of understanding. I have seen at London, four considerable hydrocephalic heads. One was thirty-three inches in circumference, twenty-four and a half inches from one ear to another, and twenty-three and a half inches from the root of the nose to the neck: yet the person, then nineteen years of age, manifested all the moral sentiments and intellectual faculties: he also read and wrote tolerably well.—(*Pl.* V. *fig.* 2). Thus these examples prove that hydrocephalic patients are not always entirely destitute

of the manifestations of feelings and intellectual faculties.

The explanation of these phenomena is easy to those who know the structure of the convolutions of the brain. From this it follows that in large hydrocephalic persons the brain is not disorganized, but that the cerebral fibres have only been changed from their vertical into a horizontal direction. Now the functions of the intellectual faculties do not depend essentially on the vertical, horizontal, or inclined position of the cerebral fibres; and their manifestations may continue without great derangement, if the pressure of the water upon the brain be not too strong, but only act upon it by degrees. It is also possible that the cerebral fibres may be elongated without the internal organization being destroyed. When an excrescence pushes the eyeball out of the orbit, the optic nerves are sometimes elongated without losing the faculty of sight. Thus all the arguments which have been founded on hydrocephalus, in order to prove that the brain is not exclusively the organ of the soul, fall to the ground.

It is sufficiently well known that we were the first who explained how the structure of the brain admits so wonderful a change in its form, without being disorganized. Yet there are writers who speak of these facts as perfectly known to them for a long time past. Sir Everard Home after having mentioned the history of a boy whose hydrocephalic head measured thirty-three inches in circumference, and whose faculties were unimpaired, says: "The preceding facts explain satisfactorily that the cerebrum is

made up of thin convolutions of medullary and cortical substance surrounding the two lateral ventricles which are unfolded, when the cavities of those ventricles are enlarged, and in this unfolded state the functions belonging to this part of the organ can be carried on." Now our Memoir announcing this truth was presented to the National Institute of France in March, 1808; and was by their report in the same year made known all over Europe.—Mr. Home's paper respecting it was read to the Royal Society in May, 1814, namely, six years after our discovery was thus laid before every learned Society in Europe! Before Sir Everard Home read his paper, I had made the demonstration of the structure of the brain in the Medico-Chirurgical Society in London. Will he maintain that he never heard our discovery spoken of, not even in so vague a manner as he has related it?

IV. On the pretended petrified or ossified Brains.

Among other phenomena which to the superficial observer seem calculated to refute the principle that the brain is exclusively the organ of the soul, it is asserted that petrified or ossified brains have not hindered the mind from manifesting its faculties. Instead of examining the truth of these narrations, our adversaries at once admit them, because they seem decisive in the refutation of our principle. We have seen similar ossifications at Vienna, Leipzic, Amsterdam, Cologne and Paris; and these pretendedly ossified brains were shown to us always with the

intention to refute our assertion that the brain is exclusively the organ of the moral sentiments and intellectual faculties. Thomas Bartholin, in 1660, first mentioned this phenomenon. In 1670 an ox was slaughtered in the Benedictine monastery of St. Justine, near Padua, and, according to the story of a monk who was cook, its brain was hard like marble. Duverney exhibited such a pretendedly ossified brain to the Academy of Sciences in 1703. Dr. Giro * and Moreschi, professors of Anatomy at Bologna, maintain, that they examined, at Rovigo, a similarly ossified brain. They cut it horizontally almost on a level with the corpus callosum, in order to examine the interior parts; and they found the colour of the circumference different from that of the interior parts, but they were unable to distinguish any cavities, thalami, or corpora striata, any vestige of the third and fourth ventricles, any corpora quadrigemina, or any pineal gland. The cerebellum presented only parallel transverse ridges; and on the basis of this pretended brain they found only unevennesses without any origin of the nerves. They maintain moreover that the ox, to which this brain belonged, and which was eight years old when it was killed, manifested the same inclinations as every other ox with a sound brain. Dumas asserts that these facts completely refute our doctrine of the cerebral organs, because, according to the statement of Duverney, the ox mentioned by him preserved its understanding.

* Gazette de Santé. Paris, Nov. 11, 1809, N° xxxii.

This erroneous opinion relative to ossified brains is very far from being destroyed, though Vallisneri has completely refuted it. From the number of such ossifications which we ourselves have seen, and the number of those which Vallisneri speaks of, it seems that they are not rare. Let us, however, first consider what Vallisneri thinks of them. He first shows* that there is no such thing as a petrification of the brain, and that this opinion took its rise only from the ignorance of the Benedictine friar. He states that he has seen even this pretended petrification; and he assures us that it is only an ossification. Vallisneri proves moreover that these bony masses are by no means ossified brains, but merely bony excrescences of the skull. He has therefore made drawings of the convolutions of the brain of an ox from above, from below, and in the middle line, in order to show that there is no analogy between the protuberances of these excrescences and the natural convolutions of the brain. He shows that one of the excrescences which was in his possession had a much stronger resemblance to the natural brain of an ox than the excrescence which Duverney had caused to be drawn, and he observes that he knew of five such instances. He consequently reproaches Duverney with his ignorance in thinking that Bartholin and himself had alone observed this phenomenon; and he expresses the greatest amazement that the Academy of Sciences should have been deceived by

* Opere Physico-Mediche. Venezia, 1733. tom. i. Art. Cervello Impetrito.

that which Duverney presented as an ossified brain. He moreover reproaches Duverney for not opening, and for not having examined, the interior parts, in order to see that there was no vestige of cavities, of corpora striata, or of thalami: and blames his credulity in supporting his assertion only by the story of a butcher.

To the observations of Vallisneri, it may be added that Duverney calls a part, on the surface, pineal gland; but, in the first place, this part is much larger than the pineal gland of an ox; next, its form is quite different; and finally, the pineal gland is not situated on the surface but interiorly. In the same manner, the part which he considers as a cerebellum, with its vermiform process, does not at all resemble the natural cerebellum. Moreover, Vallisneri justly remarks that Duverney would have found the brain as well as the bony excrescence, had he himself opened the head; and he even states that a butcher of Modena, proceeding more exactly and more carefully, found both a brain and a bony excrescence of the skull.

Messrs. Giro and Moreschi maintain that they found the centrum ovale of Vieussens in the bony excrescence which they possess. This error is easily explained: for as the brain when cut horizontally presents a large white surface, called by Vieussens, centrum ovale, so these bony excrescences, when sawed in any direction whatever, will also present a white surface like ivory, and this white surface they may consider as a centrum ovale; and, if it be oval, they may call it by that name; yet it by no

means follows that their centrum ovale has any thing to do with the centrum ovale of the brain. But why have not these gentlemen found the ventricles, the thalami, the corpora striata, the tubercula quadrigemina &c? That which is most inconceivable is, that they found no vestige of nerves, although the ox had preserved not only its intellectual faculties, but also its five external senses! Moreover, the cerebellum of the ossified brain, mentioned by Moreschi and Giro, presents transverse and parallel rings and ridges, while the natural appearance of the cerebellum of an ox is altogether different.

Dr. Simson * gives an account of the ossified brain of a cow killed at Fettercairn, a village in the county of Angus, in Scotland. He allows that this brain was much larger than the natural one; that the cerebellum, in particular, was at least six times bigger than usual; that the natural shape was not at all preserved; that the cerebellum was raised much above its ordinary height; and that only one small end which was quite rough, might be suspected of having been joined to the skull, and broken off from the parts next to it. Yet Dr. Simson thought that it was an ossified brain, because the butcher found it in the skull, and believed it to be so, and because he to whom the cow belonged received it as such &c.

Haller † observes that the ossified brain, which Bartholin speaks of, was only a bony excrescence.

* In an inquiry how far the vital and animal actions are independent on the brain. Edinburgh, 1752.

† Phy, tom. iv. p. 356.

Soemmerring advances the same opinion which we profess, *viz.* that all pretendedly ossified brains are only bony excrescences, which take origin at the internal surface of the skull, compress the brain, and gradually push it from its place without destroying it. These bony excrescences are formed ordinarily on the internal surface of the skull; but sometimes also on its external surface; and sometimes on both. We saw a specimen of the latter kind at Goettingen, which Dr. Peter Frank had presented to the university. In the anatomical collection also of the medical school at Paris, there is a skull which presents a bony excrescence both without and within. These excrescences are sometimes spongy, soft and smooth: usually however they are solid, hard and uneven, or gibbous, like stalactites or cauliflowers. These gibbosities have been considered by superficial observers as the convolutions of the brain; but neither the superior nor inferior surface of these excrescences presents any part analogous to the shape of a natural brain. In every one of them may be distinguished the place of adhesion to the surface of the skull; and this root is sometimes large, sometimes small. Sometimes the size of such excrescences is even greater than that of a natural brain. Professor Bonn of Amsterdam, for instance, showed us half an ossified brain of an ox, and this half was larger than a whole natural brain.

In respect to the influence of these bony excrescences upon the healthy functions, it is certain that, notwithstanding the existence of such substances, man and animals can live for many years, and mani-

fest various faculties. It is not however probable that the faculties suffer from them no derangement. In all examples, except that of Duverney, which he himself had not observed, have been remarked the same symptoms which take place when the brain is compressed by any other cause. The cow of which Dr. Simson speaks, ate and drank, and saw and heard, as well as usual, but she had a difficulty of breathing which made her snort in her sleep, and sleep ill: she was fed to be slaughtered, yet did not get flesh, but on the contrary fell away. Such pressure does the less harm, because the excrescence grows only by slow degrees. We have not yet had an opportunity of observing a similar case: however, it is very probable that the brain is not compressed in proportion as the bony excrescence increases, but that the cavities of the skull by degrees become larger, as happens in dropsy of the brain. Whatever, then, has been said in respect to ossified brains must be attributed to ignorance of anatomy and physiology, and principally to inaccurate observations and an excessive love of the marvellous. I repeat what we have ever said, that if ever any brain be ossified, and the animal preserve the manifestations of its intellectual faculties, we shall be the first to declare that our whole doctrine of the functions of the brain is an invention merely chimerical.

RECAPITULATION.

In this chapter I have first shown the difference between the expressions, the seat and the organ

of the soul. I have next examined whether consciousness take place in the whole nervous system, or be restrained solely to the brain; I have then shown that the brain is the organ of the mind, and that our meaning of this expression differs from that of other physiologists; and finally I have answered the most important objections against this principle.

CHAPTER III.

THE BRAIN IS AN AGGREGATION OF ORGANS.

AS it is demonstrated that the brain is exclusively the organ of the manifestations of the mind, it is to be investigated whether the whole brain must be considered as one single organ, or whether it is composed of as many particular and independent organs as there are particular and independent manifestations of the mind. On this subject, there are in philosophical writings the most ridiculous, absurd and contradictory opinions. Those who admit the simplicity of the soul infer from it that its organ must be single; others, who examine the particular faculties of the soul, maintain that the manifestations of every special faculty must be attributed to a particular organ.

As soon as philosophers began to think of the beings of nature, it was necessary to make divisions. Moses speaks of a division into brutes which live and feel, and into those which reason. The Greek philosophers, with Thales, called *soul* the cause of every phenomenon; and they accordingly spoke of a soul of plants, a soul of animals, and a soul of man. Soul or *anima* was therefore that which gave life and sensation. The soul (*anima*) was moreover not only divided into anima of plants, anima of animals, and into anima of man; but one soul was

considered as vegetative, and another as sensitive. Secondly, all the inclinations were regarded as the result of the *animus*. Finally, the intellectual or reasoning part was called *mens*. Pythagoras, St. Paul, Galen, Gilbert, Gassendi, Bacon, Van Helmont, Wepfer, Leibnitz, Frederick Hoffmann, Haller, Blumenbach, Soemmerring, Reil, Barthez &c. admit different causes of the different phenomena of animals and man. Accordingly, Plato and several ancient writers speak of an irrational and of a rational portion of the soul; and all those who admit only one soul in man, as Anaxagoras, Aristotle, Thomas Aquinas, Descartes, Stahl &c. are obliged to acknowledge at least several faculties of the single soul. St. Augustin determined with great exactness the faculties which are common to man and animals, and those which are proper to man. Malebranche and many other philosophers speak of principal and secondary faculties. The former are understanding and will: the subdivisions of understanding are perception, memory, judgment and imagination; and those of will are inclination, desire, affections and passions. Some authors have even subdivided these special faculties: thus, Vieussens speaks of two kinds of imagination: and others admit several kinds of memory, as a local memory, a verbal memory, a memory of facts, and a memory of time. Thus various principles, at least various faculties of the same principle, have at all times been admitted.

As the principles, or the faculties, were divided and subdivided, so different seats were assigned to them. The rational soul was commonly placed in

the head; the irrational in the viscera of the abdomen. In this respect the ventricles of the brain have at all times been considered as of principal importance. The Arabs placed common sense in the anterior cavity of the brain, imagination in the second, judgment in the third, and memory in the fourth. During several centuries, the brain was considered as the organ of perception, and the cerebellum as the organ of memory, the degree of memory being measured by the protuberance of the occiput. St. Gregorius Nyssenus, in order to explain why the functions of the mind are not troubled, although the different senses propagate different impressions, compares the brain to a town which has several entrances and a great number of streets, by means of all which it is possible to arrive at the same point. Nemesius, the first bishop of Emesa, under the reign of Theodosius, taught that the sensations have their seat in the anterior ventricles, memory in the middle, and understanding in the posterior ventricles.

Albertius Magnus, archbishop of Ratisbon, in the thirteenth century, delineated a head, and indicated upon it the seats of the different faculties of the mind. He placed common sense in the forehead, or in the first ventricle of the brain, cogitation and judgment in the second, and memory and moving power in the third. Peter de Montagnana, in 1491, published a delineation of a head, on which were indicated the seat of sensus communis, the cellula imaginativa, cellula æstimativa seu cogitativa, cellula memorativa, and cellula rationalis. Lodovico Dolci

published a similar delineation. He placed common sense in the forehead; imagination behind it; understanding in the cerebellum; and memory still lower in the neck. According to Serveto, the anterior ventricles receive the images of external impressions; the third ventricle is the seat of thought; the aqueduct of Sylvius, the seat of the soul, and the fourth ventricle the seat of memory. Willis considered the corpora striata as the seat of sensation and attention; and the medullary mass as the seat of memory: he placed reflection in the corpus callosum; and derived the moving spirits from the cerebellum.

Charles Bonnet considered each fibre of the brain as a particular organ of the soul. Boerhaave said that imagination and judgment must have different seats, because the former is active in dreaming. and the latter in watching. Haller and Van Swieten * supposed that the internal senses occupy different places of the brain; but they considered its organization as too complicated, too intricate, and too difficult of investigation to permit us to hope that we should be able to point out the seat of memory, of judgment, or of imagination. Mayer, Professor at Frankfort on the Oder, thought it probable that the soul exercises its different faculties at different places of the brain; and he was disposed to think that the cineritious substance is the organ of memory, and the cerebellum that of abstract

* Van Swieten, tom ii. p. 454. " Quis memoriæ et rationis sedem in hoc mirabili et intricatissimo organo determinare poterit?"

ideas. Prochaska thinks it more than probable that every internal sense is attached to a particular organ. Platner speaks of two organs of the soul; a superior and an inferior. Mallacarne cannot imagine that the medullary substance of the brain is every where fit to receive the same impressions: he denies the central point of the nerves; considers the cerebellum as the seat of the intellectual faculties; and measures these according to the number of lamellæ of which the cerebellum is composed. Tiedemann, Wrisberg, Soemmerring and an immense number of physiologists and philosophers, admit the plurality of the organs; and they maintain that the different parts of the brain are destined to different functions. Soemmerring speaks, like Haller, of different provinces of the brain.

Thus from all these quotations, which might be extremely multiplied, it follows that the idea of the plurality of the seats or organs is very ancient, and that those who maintain that it is an invention of Gall are mistaken. It is, now, therefore, only to be determined what are the faculties, and which are their respective organs? On these two questions I shall afterwards found a more detailed inquiry. Let us first examine, in a general way, the proofs which induce us to think that the brain must be considered as composed of different organs.

It is a general observation that nature, in order to produce various effects, has varied their material conditions. This is observed throughout all nature: every salt and every metal has its own crystallization; every plant and every fruit-tree has its

particular organization; even the parts of the same tree, as wood, bark, leaves, flowers and fruit, possess somewhat varying qualities. It is the same with animals: the organization of every variety of animal is modified, and, in the same animal, there is a particular organ for every function: the liver is destined to the secretion of bile, the heart and blood-vessels, to circulation, and the lungs to respiration. The five external senses are separated, and are independent of each other. Thus nature is not so attached to simplicity and unity, as certain speculative philosophers are pleased to maintain. This plurality and independence of the organs of automatic life, and of the five senses, renders it probable that the different internal sensations and functions of the mind are also manifested by different and independent organs. Besides analogy, however, there are on this subject, still other proofs furnished by the psychology of animals and man in the state of health and disease.

It is necessary that the brains of different animals should be different, because the faculties of these animals vary. The beaver which builds its hut, the dog which hunts, the black-bird which sings, the swallow which migrates, cannot have similar brains. Thus to have a brain of this kind or of that is not an indifferent matter: the organization of the brains of these animals must be as different as that of their muscles. Even individuals of the same variety do not possess all faculties in the same degree: certain individuals excel, others are mid-

dling in all; some individuals are endowed with genius, others are idiots: hence the organization of their brains cannot be equally perfect. Moreover, if the brains of different animals were not composed of different organs, why should their understanding increase in proportion as their brains become complicated? It is also necessary that the cerebral organization of the sexes should at least be modified; for certain faculties are more active in women and females, and others in men and males. These modified manifestations are easily understood if we admit that certain organs are more developed in men and males, and others more in women and females.

In the same individual, moreover, certain propensities, sentiments and intellectual faculties, manifest themselves with great energy, while others are scarcely perceptible: one excels in verbal memory, while he cannot combine two philosophical ideas; another is a great painter, and a bad musician, or a miserable poet; and a third is a great poet, and a bad general: a man may be pious and stupid, or pious and intelligent; and every one has his peculiar gifts. Hence the same mass of the brain cannot preside over the same functions. If there were only one external sense for all impressions, all the functions ought to take place as soon as one sense is active; but as the functions of the external senses are attached to different organs, one of them may be weak and another strong. It is the same with the internal senses: if the same organ manifested

every faculty, how could the mind, by means of the same instrument, manifest one faculty in perfection, and another in a very limited manner?

The propensities and intellectual faculties do not manifest themselves simultaneously: several appear earlier; others disappear more lately. Certain faculties are very energetic in children, and others appear only in adult persons: some faculties disappear at the age of fifty or sixty, and others last till ninety or a hundred. Now if the manifestations of all faculties were dependent on the same organ, they ought to appear and disappear simultaneously. All these difficulties, however, are removed, if we admit different organs which are developed and diminished, at different periods, in the same way as are the external senses. Smell and taste thus appear earlier than seeing and hearing, because their relative organs are earlier developed. The faculties of animal life, moreover, cannot continue incessantly to act, but need rest; and it is known that study too long protracted produces fatigue, while we may continue to study by changing the object. Now if the brain were a single organ performing all the functions of the mind, why should it not be more fatigued by this new species of action? Our eyes may be fatigued by looking at pictures, but we can still listen to music, because there is one organ for hearing and another for seeing. This consideration is very important in medicine; for, by attention to these circumstances, it is often possible to prevent partial insanities. Thus, if a person have one organ so very active, whether on account of its

great developement, or its great irritability, that this activity is almost involuntary, or that the person has not the power of putting it in action, and of recalling it to rest, then it is necessary to avoid every thing that has any relation to this faculty, and to put in action quite different ones. This alternate state, however, of action and rest would be impossible, if there were only one single organ.

As in the state of watching the same organ cannot be always active, but must at intervals rest; so in the state of sleeping all organs do not remain inactive, but a particular one occasionally enters into action, and this constitutes the state of dreaming. Watching is indeed called the state wherein the will can put in action the organs of the intellectual faculties, of the five senses, and of voluntary motion; but it is most incorrect to define watching as the state wherein all these organs are active; for it cannot happen that all faculties should at the same time be active. All organs being fatigued take rest, and this state of rest is sleep; but any particular organ, or even several organs, may be active while the others rest. The peculiar sensations, then, or ideas, which result from this particular activity, constitute *dreams*, which are more or less complicated according to the number of the active organs. It may here be asked, whether the soul or mind can ever be without any idea? Formerly it was a general opinion that activity is the essence of the soul; and in order to maintain this opinion, it was said, that in the deepest and most complete sleep, the soul continues nevertheless to act and to think,

but that no one had consciousness of it. It may be asked, how are we assured of this action? And it may be reckoned entirely supposititious. At all events it is evident that the state of dreaming proves the plurality of the organs of animal life; and it would be impossible to have particular dreams, or combinations of ideas and sensations, if the brain were one single organ, and if every faculty were not attached to a particular and independent organ.

The state of somnambulism equally proves the plurality of the organs. This is a state of incomplete sleep, wherein several organs are watching. Now it is known that the brain acts upon the external world by means of voluntary motion, of the voice, and of the five external senses. If, then, in sleeping, particular organs be active, dreams take place; if the action of the brain be propagated to the muscles, there follow motions; and if the action of the brain be propagated to the vocal organs, the sleeping person speaks. Indeed it is known that some sleeping persons dream and speak; others dream, speak, hear and answer; and others again dream, rise, do various things and walk. This latter state, then, is called somnambulism, that is, the state of walking during sleep. Now as the ear can hear, so may the eyes see, while the other organs sleep; and there are facts quite positive which prove that several persons in the state of somnambulism have seen, and certainly always with open eyes. There are also convulsive fits in which the patients see without hearing, and *vice versâ*.

Some somnambulists even do things of which they

are not capable in a state of watching; and some dreaming persons reason sometimes better than they do when awake. This phenomenon is not astonishing. If we wish to reflect upon any object, we avoid the noise of the world and all external impressions; we cover the eyes with our hands; and we put to rest a great number of organs in order to concentrate all vital power in one or in several. In the state of dreaming and in somnambulism, this naturally happens: hence, the manifestations of the active organs are then often more perfect and more energetic, the sensations are more lively, and the reflections deeper, than in the state of watching. Without knowing their danger, such persons do things which, though possible, they yet would not do, were they acquainted with the danger they run. Somnambulists, therefore, ought not to be awakened when they are exposed to danger.

Inspirations, visions and similar phenomena, have their explanation only in the plurality of the organs; and these phenomena consequently contribute to demonstrate that plurality. In order to understand visions, it is necessary to bear in mind the nature of the state of dreaming. In dreaming, the whole external world is represented inwardly to the mind: we see our friends, or enemies, we speak with them, we walk, eat, drink, sing, hear music &c.; and all these things happen only in the brain of him who dreams. Visions then are only internal sensations or ideas, so strong and energetic, that, though in the state of watching, the person similarly refers them outwards and considers them as real: he sees,

for instance, inwardly some person, and he admits his outward existence. Visions are transitory or permanent; and, in the latter case, they form a true alienation of the mind. This explains why visionaries fancy that they see beings invisible to others, or that they are accompanied by demons; and why some sorcerers have imagined they conversed with the devil. It is even known that sorcerers have produced such illusions by external applications or by frictions with narcotic ointments composed of dulcamara, bella donna, stramonium, hyosciamus, opium &c.

The state of disease proves also the plurality of the cerebral organs: for how is it possible to combine partial insanities with the unity of the brain? It is with the cerebral parts as with the nerves of the senses. Any nerve may be diseased, while the others are in health: we may be blind, and hear; or we may be deaf, and see. Dr. Parry of Bath told me, that in one of his patients, while the motion of the tongue was perfect, the taste of one side only of the tongue was impaired. I have myself seen several facts of this kind; and they are in general well known to medical men. Now every one, from such partial indisposition, draws the inference, that the nerves perform different functions. Why should it not be the same with the cerebral parts? One faculty may in reality be deranged, while the manifestations of all the other faculties of the mind may be regular; and on this depend all fixed ideas or monomaniæ. On the other hand, there are madmen who are reasonable only in one kind of the manifes-

tations of the mind. A chemist was a madman in every thing except chemistry; and an embroiderer during her fits, and in the midst of the greatest absurdities, calculated precisely how much stuff was necessary for any particular piece of work. From all these considerations, it follows that there are as many organs as there are special and independent faculties; and consequently that the brain cannot be considered as one single organ, but as composed of several. I shall farther answer the most important objections against this principle.

Objection 1.—*Unity of Consciousness.*

Philosophers incessantly repeat that the organ of the soul cannot be complicated, because consciousness is single; and this objection is very ancient; being made to Boerhaave, Haller and Van Swieten, who had commented on the duplicity, and consequently on the plurality of the organs. This duplicity of the brain was known even to Hippocrates, who said, "the brain of man is double as well as that of animals." Van Swieten observes that, as we have two ears and two eyes, and as the consciousness of the impressions of two similar organs is single, so the consciousness of the mind is single, though the brain is double. The explanation of this phenomenon may indeed remain unknown for ever, but it is not therefore less true that the brain is double, and that each half is composed of different parts. Are there not many things which cannot be explained? Automatic life, for instance, is *one;*

and yet it is composed of different functions, which are produced by different organs: it is still always one, though more or less complicated in the different kinds of animals. Such also is the case with animal life: it is more or less complicated in different animals; the different faculties are manifested by means of different organs; these organs exert a mutual influence; and as long as this mutual influence exists, the unity of animal life also exists; but if the mutual influence be deranged, the unity of animal life is also deranged. Hence it is not true that consciousness is always single, either in respect to the external senses, or in respect to the internal organs. There are patients who see objects double; and all monomaniæ have a complicated consciousness. Tiedemann speaks of one Moser, who was alienated on one side of his brain, and observed his madness with the other side. One of Gall's friends, a physician, often complained that he could not think with the left side of his head: the right side of his head is one inch higher than the left. Gall attended a gentleman who, for three years, on his left side, heard peasants insulting him: he commonly discerned his derangement, and rectified his error; but if he had drunk a little too much, or had a fit of fever, he imagined that he really heard the voices of peasants. A great number of madmen, also, hear angels sing, or the devil roar &c. only on one side. Thus, as both hemispheres may be in a quite different state, so may the organs of each side be differently affected. In treating of the functions of the five senses, I have examined various opinions as to the explanations of

this single consciousness. Whether however the unity of consciousness may be explained or not, it is indubitable that all the organs of animal life are double.

Objection 2.

It is also objected that by this separation of the organs the unity of the organization would be destroyed, but that on the contrary all organic parts are dependant on each other. It is certainly impossible to deny the mutual influence and dependance of the different organs; and in fact none can insist upon this truth more than we do. There is, however, a great difference between the correct assertion, that the different organic parts exert a mutual influence upon each other, and the incorrect one, that each part does not exert its particular function. This may be illustrated from automatic life. Digestion is necessary to the circulation of blood, and to the secretion of bile; but does the stomach produce the circulation of blood, or the secretion of bile? Nutrition depends on digestion, chylification, sanguification, respiration, circulation and other auxiliary functions; but is not every function attached to some particular organ? We observe the same in animal life. Without the sense of hearing we cannot hear any language, but does hearing invent the vocal signs? We shall afterwards see that certain ideas cannot take place without the external senses, but that still the external senses do not produce the conceptions of these ideas. Again, whatever is necessary to the nutrition of the brain contributes to the pro-

duction of that organ, as it does to that of the eyes, ears &c.; and no organic part, when detached from the body, can preserve its perfect state of organization, or perform its function; but can we therefore say that the eye does not see, or that the ear does not hear?

Objection 3.

It is often objected that the particular organs of the brain are not as distinctly separated, as the nerves of the five external senses. It is indeed true the limits or lines of separation between the different organs cannot be exactly determined; but this is equally impossible as to the five external senses: the nerves of motion and feeling have not yet been separated, though these nerves must be different. The structure of the skin must be different at different places, as is evident by the different exhalation arising from it, and the hair which grows on various parts of it; but the difference of these parts of the skin has not yet been demonstrated. Neither the limits of the olfactory nerve, nor those of the nerve of taste, are better known, or more distinctly separated from each other, than are the different bundles of the internal organs. Nay it is possible to demonstrate the relation between the developement of these bundles, and corresponding manifestations of the moral sentiments and intellectual faculties. Thus anatomy shows that the bundles which form the convolutions situated in the forehead are smaller, but more numerous, while the posterior bundles are less numerous, but larger. (*Pl.* III. *fig.*

1 & 2.) In the same manner we shall see that the faculties of the forehead are numerous, but less energetic, while the faculties whose organs are situated in the posterior and superior part of the head are less numerous, but very energetic.

Objection 4.

The comparison of the internal organs with the five external senses is rejected as a proof of the plurality of the organs, because the five external senses may be reduced to one single sense, namely, to sensation, in the same way as all the internal faculties may be reduced to the faculty of thinking. It is true that the five external senses only feel, or operate some kind of sensation; but feeling or sensation in this sense is a general expression, and all general expressions must be analyzed, in order to indicate particular objects. It is the same throughout nature. Gravity, density, volume &c. are general expressions of physics; but is it not necessary to specify particular physical qualities in order to indicate all determinate bodies, as gold, silver, copper, iron &c.? *Life* is a general expression, and its common phenomena, as birth, nourishment, increase, decrease and death, are observed in all living beings—in plants and in animals. Is it not, however, necessary to discriminate vegetation from animalisation, since nutrition is differently modified in plants and in animals? Nay, all the common faculties of plants and animals must be reduced to particular specification, in order to indicate each determinate

plant, and each determinate animal. *Secretion* is a general expression; but in similar cases the particular secretion must be indicated; and they actually are performed by particular organs. The secretion of bile is performed by the liver, that of urine by the kidneys &c.

It is the same in animal as in organic life: sensation is a general expression, but every kind of sensation must be specified. It is a quite different thing to have a sensation of light or of sound, of taste or of smell: these particular sensations then are performed by particular organs. The thinking power is a common faculty; but the thinking of space, of form, colour, tone, number &c., are particular manners of thinking; and these particular manners of thinking are manifested by particular organs. Hence this objection, instead of refuting the plurality of the organs, proves its necessity.

Objection 5.

Another objection is the following: the nerves of the five external senses are homogeneous; and their functions are only different on account of their external apparatus: accordingly the auditory nerve in the eye would see, and the olfactory nerve in the ear would hear; but the internal organs are destitute of such external apparatus, and consequently they are all the same, and perform the same functions. This opinion is still pretty general. As a polypus may be divided into several pieces, and every piece become an independent whole, Cuvier applies this

phenomenon to the nervous system. He compares the nervous system with a net, or with a broken loadstone, which are originally composed of homogeneous parts; and he thinks that the different functions of the nerves must be attributed to their external apparatus, their blood-vessels, their ramifications and their combinations; in one word, to an infinity of secondary circumstances, rather than to the internal structure of the nerves. It may however be proved anatomically and physiologically, that not only the external apparatus, but also the internal structure of the nerves is different. I admit five kinds of nerves, and subdivide each kind: the first kind of nerves presides over automatic life; the second over voluntary motion; the third over the functions of the five senses; the fourth over the moral feeling; and the fifth over the intellectual faculties. The nerves of the first kind are soft and gray, or whitish red; the nerves of the second are white and firm: the nerves of the five external senses differ from each other in consistence, colour, form and texture: and the fibres of the brain and cerebellum are white and delicate. Moreover, every nerve, and even the different parts of each nerve, have their origin in a particular quantity of cineritious substance. Now all these anatomical circumstances are always the same, and must consequently be essential to the structure and function of the nerves. Cuvier, therefore, is in contradiction with himself when he says, * "that, whatever may be

* Loc. cit. p. 192.

the position of the parts, and whatever circuitous ways the nerves must take in order to arrive at the parts to which they belong, the analogous parts constantly receive their nerves from the same pair. Similar nerves have always similar distribution. The smallest pairs which might be easily supplied by some neighbouring pair, as the fourth and sixth pairs, preserve their existence and their destination." J. Hunter, before Cuvier, had made the same observation. From these anatomical proofs it seems natural to conclude that the nerves are not entirely similar, and do not conduct one identical fluid as the arteries do.

The difference of the nerves themselves is equally proved by physiology. The various functions of automatic life, as the secretion of bile, saliva, tears &c., suppose organs essentially different. Is it not then the same with the nerves of the five senses? Their external apparatus are said to be different, because they receive different impressions; but how is it possible that different impressions should be transmitted to the brain by the same nerves? How then could the impressions of light be propagated by the auditory nerve. If the manner of propagating the external impressions, and their communication to the brain, were essentially the same, and only relatively weaker or stronger, the perceptions of these similar impressions ought also to be essentially the same, and only weaker or stronger. Hence the difference of the propagated impressions requires a corresponding difference in the internal structure of the nerves which propagate

them. Moreover, the internal structure of the nerves must be different, because the nerves perform their special functions by internal irritations alone. The sensations, accordingly, which we feel in dreaming are the same which are produced by external impressions. A person who has lost his eyes dreams that he sees; while another thinks he feels pain in an amputated limb: the increased flow of blood toward the eyes makes us see shining objects or flame; in the ears, it excites tingling and humming; and towards the skin, it produces the dream that we are in a lukewarm bath. Finally, the illusions of the five external senses in different diseases are produced only by internal causes. From all these phenomena, we must infer that the organization of every nerve is particular.

It is replied that the difference of every organ cannot be demonstrated: I answer that the contrary also cannot be established. Hence the homogeneous structure of the organs is neither proved nor refuted by any consideration respecting the five senses. There are however many things similar in appearance, and really quite different in nature. Many fluids look like water without being aqueous. Who can distinguish all the varieties of the apple-tree by the difference of their ligneous fibres, which must nevertheless be different, since their flowers and fruits are so? Hence physiological proofs must supply what is deficient in anatomical ones.

The identity of the nerves is principally supported by the phenomena of what is called animal magnetism. An animal fluid is said to be diffused through-

out all nature: it is called ether, and considered as the cause of all phenomena: it is said to be communicated to other persons by the will of the magnetiser; and then not only to excite the organs, but, according to certain magnetisers, to communicate also to the soul the different external impressions by means of each nerve, or, according to other magnetisers, this animal fluid is the guide of the external impressions. The will and its modifications are supposed to be communicated by it; and therefore the will of the magnetiser and of the magnetised person are said to govern each other. I certainly do admit an animal fluid which is communicated to the nerves; yet I wish to propose certain questions to these magnetisers, the answer of which would interest me. I wish to know in what state this fluid is supposed to be communicated; whether it varies only in quantity, or whether, being communicated from one person to another, its quality is also modified; and then whether this fluid acts immediately upon the soul of the magnetised person, or whether it acts only upon the organs, and by means of these upon the soul? Is it not indeed granted that this fluid varies in quality, because according to all magnetisers it is necessary to place every one in relation? and it seems certain that it acts only upon the organs; for children and idiots are unfit for such experiments, while they are said to succeed principally with very delicate and irritable persons. I wish also to know with what the magnetised individuals can become acquainted; and why are they said to know more than the magnetisers themselves?

According to common observation, they are acquainted only with that which is known in the country where they live. I allow that a fluid may excite the activity of the organs, but I think it is impossible that it can render every nerve fit to perform any manifestation of the mind. A certain fluid may also contribute to the state of health; but it cannot produce all the phenomena of living beings, and cure all diseases. From these considerations it results that the structure of the nerves is different, and that therefore their functions are also different.

Objection 6.

Plattner has made the following objection: a musician plays with his fingers on all instruments, why therefore should not the soul manifest all its operations by means of the same organ? This observation is rather in favour of, than in opposition to, the plurality of the organs. First, by the by, there are ten different fingers which play; and the instruments present different chords or holes. We admit, however, only one organ of music; and all kinds of music are produced by this organ. Hence, this assertion of Plattner does not invalidate our principle.

Objection 7.

All voluntary motion is produced by muscles: it is consequently deemed possible that all ideas and sensations may be the result of the different motions of the cerebral fibres. Those, however, who make

this objection forget that the different motions are performed by different muscles. There are flexor, extensor, pronator, and other muscles; and every muscle is composed of many fibres which have various directions. Now in every position and in every motion of the body different muscles are active. In the same way therefore it may be concluded that every kind of sensation or idea is attached to a particular organ.

RECAPITULATION.

In this article, I have proved that it is necessary to make divisions and subdivisions of beings and their functions, and that, in reality, these have at all times been made: I have stated the proofs, according to which it is evident that every faculty is manifested by a particular organ: and I have supported this assertion by analogy; by the different qualities of different kinds of animals; by the different number of their faculties; by the modifications of the faculties in both sexes and in the same individual; by the want of simultaneous manifestations of the faculties; by the alternate action and rest of the faculties; by the state of dreaming; by that of somnambulism, and of visions; by partial alienations; and finally by the refutation of all objections.

CHAPTER IV.

MEANS OF DETERMINING THE FUNCTIONS OF THE BRAIN.

I. On the absolute Size of the Brain.

THE greater number of natural philosophers, being convinced that the brain is the organ of the soul, have concluded that its functions must be proportionate to its size. The brain of man was accordingly found larger than of the majority of tame animals, as the horse, ox &c. Without therefore examining living beings more strictly, the superiority of man was at once attributed to the absolute size of his brain. Thus, according to Erasistratus, Aristotle, Pliny, Galen, Portal * and others, man has the largest brain.

Modern discoveries, however, have shown that the brains of whales and elephants are larger than that of man. Those, therefore, who measure the faculties of animal life according to the absolute size of the brain must err ; for whatever the understanding of the elephant may be, and though the whale be declared king of the inhabitants of the sea, no one will attribute either to the one or the other those superior faculties which constitute the distinctive character of man. Besides, if we more closely study nature, we find that the brains of the monkey and

* Anatomie Medicale, tom. iv. p. 30.

dog are smaller than those of the ox, ass and hog, yet the former come more nearly to man in respect to their intellectual faculties. Moreover, different animals, as the wolf, tiger, sheep and roe, may be ranged in the same class with regard to the size of their brain; yet their qualities are quite different and in some respect even opposite. It is the same with the sparrow-hawk, cock and pigeon. Finally, we see that nature produces the most surprising effects by means of very small brains. Observe the honey-bees, contemplate their interior economy, their local memory, the care they take of their progeny, their anger and revenge, their natural language. Is there any thing more curious than the conic hole of the pyrmicoleon, or the web of the spider? Do we not observe in the cock the jealousy of the stag; in the red-breast, the propensity to fight of the wild boar &c.? If, however, the absolute size of the cerebral mass were capable of being employed as a measure of the moral sentiments and intellectual faculties, all animals which have the same quantity of brain ought to manifest absolutely the same faculties, and the faculties of animals could differ then only in energy. It would then be inexplicable why one animal lives in society, and another in solitude; why one takes care of its progeny, and another does not; why one constructs, another sings &c. It is not, however, possible, even in individuals of the same kind, to measure their faculties according to the absolute size of their brain. Hence it is necessary to look for other means of determining the degree of the faculties of the mind.

II. Of the Size of the Brain compared with that of the Body, and also with that of the Nerves.

The brain of the elephant and whale is larger than that of man; but their bodies are also much heavier than that of man. This circumstance seemed to prove the superiority of the human brain; and anatomists no longer said that man had *absolutely* the largest brain, but only that he had the largest brain *in proportion* to his body. According to the principle admitted as to the origin of the nerves, it was easy to explain how the moral sentiments and intellectual faculties were indicated by the size of the brain, compared with that of the body; for all nerves were said to be prolongations of the cerebral mass, and to be proportionate to the body;* and consequently, in a large body, the greater part of the nervous system must be employed for the purpose of bodily functions, and there must remain a small portion of the brain for the superior faculties.

The brains of reptiles and fishes are also very small in proportion to their bodies: a crocodile twelve feet long, a serpent eighteen feet long, a turtle that weighs from three to five hundred pounds, have brains that scarcely weigh one drachm. There are insects in which the nerve of one single sense exceeds the size of the brain: the great vulture of

* Some authors, it is true, considered the brain and spinal marrow as a homogeneous mass, and they derived the nerves from the spinal marrow itself; but then they supported this assertion by other observations.

the Alps (Laemmergeyer) has a brain almost as small as that of the raven: and the turkey-cock has no more brain than the parrot. It was concluded from these facts, that the faculties are in the proportion of the brain to the body.

This conclusion was drawn too hastily, and was not grounded upon a sufficient number of observations. Accordingly Wrisberg, Soemmerring, Blumenbach, Cuvier and other anatomists wished to verify this principle; but found that the sparrow, canary-bird, linnet, red-breast, bulfinch and several species of monkies have, in proportion to their body, more brain than man. The intellectual faculties, therefore, of these animals ought to surpass those of man, or at least to approach to them; and rats and mice ought to have more understanding than the horse, stag, dog and elephant, because the former have, proportionally to their bodies, a more considerable quantity of brain. According to this principle, it should also be impossible to discover any difference as to the faculties of different species of animals, whose brain bears the same relative proportion to their body. Moreover, it would be very difficult to determine the just proportion of the brain to the body and to the nerves. The proportions noticed by Cuvier are evidently incorrect: in adult men, he admits the proportion of one to thirty-five: we believe the proportion of one to forty, or fifty, or even sixty, to be more general; for if we suppose that a grown-up man weighs only a hundred and twenty pounds, and his brain from two to three pounds, the proportion fixed by Cuvier is incorrect.

Besides, this anatomist does not say how he had separated the brain from the other parts; whether he left smaller or larger portions of the nerves and membranes; whether the blood-vessels were empty or filled; or at what age his comparisons were made.

Haller remarked that children have a larger brain than adults in proportion to their body, and consequently that, if their faculties were measurable by the proportionate size of the brain, they ought in understanding to excel grown-up persons. It may, however, be replied, that the brain of children is not yet perfectly developed, and hence unfit for the manifestations of the intellectual faculties. Haller remarked also, and Soemmerring and Cuvier after him repeated, that it is very difficult to determine the proportion of the brain to the body, because the body grows lean or fat, and augments or diminishes by half its weight, while the brain does not undergo any change. This assertion is refuted by experience: for though the brain cannot grow fat, that is, though no adipose substance can be deposited in the cerebral mass any more than in the substance of the lungs, yet the brain participates in the nutrition of the body as well as every other organic part. In young and well nourished men and animals, in the flower of youth, the convolutions of the brain are more plump and nearer to each other; and the whole brain is more heavy than in old lean and emaciated persons, who have died of hunger and consumption. We have particularly directed our attention to this subject, and examined with this

view rabbits, cats, monkeys and men. Hence the remarks made by Haller would not be sufficient to refute the opinion that the faculties of the mind may be measured according to the proportionate size of the brain.

Wrisberg and Soemmerring thought they might proceed in a surer way, if they determined the faculties according to the proportion of the brain to the nerves. They observed that the nerves are much more considerable in many animals than in man. This proportion, however, though more plausible than that of the brain to the body, is not yet universal. The seal has, proportionally to its nerves, a larger brain than the house-dog; and the porpoise, more than the orang-outang: yet we do not observe the same proportions in the faculties of these animals.

It seems that Soemmerring, in some women, found smaller nerves than he was accustomed to see in men; and from these observations he concluded, that as the brain of women is smaller than that of men, the proportionate size of their nerves is preserved; in other words, that although their brain is ordinarily smaller than that of men, yet they possess the same degree of understanding, because their nerves are also smaller than those of men. Having been particularly attentive to this subject, we find that there is neither any proportion between the nerves of the five external senses, nor between the nerves and the brain; neither is there any general rule in respect to the sexes: sometimes one, sometimes another pair of nerves is large or small in men or in women, and that without any relation to the brain.

For the same reason, it is also found that the functions of these different parts are in no proportion one to another. There are individuals whose senses are very weak, and who yet manifest great energy of moral sentiment and intellectual faculty, and *vice versâ*. Moreover, if the proportionate size of the brain to the nerves were a means of measuring the faculties of the mind, these means would yet be confined to theory, and could never be applied to living persons, because there is no possibility of distinguishing the size of the nerves before the dissection of the body.

The comparison of the brain with the spinal marrow, admitted by Soemmerring, Ebel and Cuvier,* is not more exact than the other proportions I have mentioned. Cuvier himself quotes exceptions; for instance, in the porpoise. Blainville also is entirely wrong in saying that the occipital hole indicates the proportion of the spinal marrow to the brain: the occipital hole is proportionate to the medulla oblongata, and not at all to the spinal marrow. Besides, there is no proportion between the spinal marrow, nor even the occipital hole, and the brain: the brain may be large, and the occipital hole or the spinal marrow small, or *vice versâ*. This is the case not only in different species of animals, but even in different individuals of the same species. Moreover, this proportion could not be known in living persons: consequently, even if it were correct it would be useless in anthropology.

* Leçons d'Anatomie comparée, tom. ii. p. 150.

III. Of the Facial Angle of Camper; of the Occipital Angle of Daubenton; and of the Size of the Brain in proportion to the Face and Neck.

In order to measure the extent of the brain and, as he imagined, the corresponding energy of the intellectual faculties, Camper drew a vertical line touching the upper lip and the most prominent point of the forehead; and also a horizontal line crossing the former, and touching the tips of the upper front teeth and the external opening of the ear, or at least corresponding to these points in its direction. Camper thought that man and animals have more understanding, the more the upper and inner angle formed by the two lines, or that including the upper jaw, nose &c., is obtuse; and on the contrary, that man and animals are more stupid, the more this facial angle is acute. Lavater, Cuvier, Richerand and a great number of anatomists and physiologists approve of this facial angle. According to it, Lavater composed the progressive scale of heads from the frog to the Apollo Belvidere. Cuvier also composed different tables, which indicate the facial angles of men and different animals; and he fixed for the facial angle of Europeans, in a child ninety degrees, in an adult person eighty-five, and in an old decrepid man fifty degrees. This manner, however, of measuring the intellectual faculties is not more correct than those I have previously mentioned. The facial angle applies only to the anterior parts or the brain situated in the forehead, and is inapplicable to all the lateral and posterior parts: hence the facial

angle could, even if there were no other objection, indicate only those faculties whose organs constitute the forehead. Besides, it is entirely impossible to determine in a general way the proportion of the forehead to the face: in new-born children the forehead is flat; but in children from three months to eight or ten years of age, the forehead is ordinarily prominent, and forms a more obtuse angle than it does either in new-born children, or in adult persons. Hence Cuvier is wrong in admitting that the facial angle decreases in proportion as the child advances in age. Even however, if this were the case, it would be possible only to say that the facial angle will be of so many degrees in grown-up and in old persons, when it was such or such in infancy. It is utterly impossible to draw a conclusion from one individual; for among a hundred persons not two present the same facial angle. Yet according to the supposition of Cuvier, all children, all grown-up, and all old Europeans, ought to have the same proportion of the cerebral mass to the face. Moreover, this facial angle is useless in respect to animals; for, as Blumenbach has observed, three fourths of the animals known to us have nearly the same facial angle; and are yet endowed with very different propensities. Finally, Cuvier himself has remarked that the brain is not situated immediately under the forehead in all animals, but that in a great number of them the two plates of the skull are separated from each other. This happens indeed not only in the different species of animals, but also in old persons, whose skulls often present a considerable distance between the

two plates. In hogs, the brain lies one inch, and in the elephant thirteen inches deeper than is indicated by the external table of the skull; and Cuvier, in order to avoid this inconvenience, draws the tangent or vertical line upon the internal plate. In many animals, as in several varieties of cats, and in the rodentia, the brain inclines downward behind the frontal sinus, and it is quite impossible to draw a facial angle according to the most prominent point of the forehead.

The facial angle is also a very imperfect measure of the faculties of man. We know of negroes whose jaw-bones are extremely prominent, but who manifest great intellectual faculties because their foreheads are much developed. According to their facial angle, they ought to come after many stupid Europeans who have a small forehead, but whose jaw-bones are inclined backwark. From all these considerations, then, it follows that the facial angle cannot serve as a means of measuring the moral sentiments and intellectual faculties.

The occipital angle of Daubenton is formed by a horizontal line drawn from the inferior edge of the orbit to the posterior edge of the occipital foramen, and by a vertical line that cuts the first, and passes between both condyles over the surface of the occiput. Now this occipital angle, according to the observation of Blumenbach, is, in all animals, of from eighty to ninety degrees; and consequently, its difference is not proportionate to the divers faculties of animals. Moreover, the occipital angle indicates only the developement of the

occiput, but does not show that of the lateral and superior parts of the brain; and this is sufficient to prove its inutility.

Some physiologists, as Soemmerring and Cuvier, have compared the size of the brain in general with that of the face; and, according to them, animals are more stupid as the face is larger in proportion to the brain. Cuvier calls the senses of smell and taste, which chiefly occupy the face, the functions most entirely brutish. In order to facilitate the examination of this proportion, Cuvier saws the skulls vertically and longitudinally; and in this way it is easy to compare the size of the cavity of the brain with the area of the face. Even the ancient artists observed a certain proportion between the forehead and the face; and the statues of their high-priests, sacrificators, demi-gods, gods, and principally that of Jupiter, present high, large and vaulted foreheads. The superiority, however, of the intellectual faculties does not result from the proportion of the forehead to the face, but from the developement of the forehead itself. There have been great men whose faces were very large, and whose jaw-bones were very prominent. Leo, Montaigne, Leibnitz, Haller, Mirabeau &c., had large faces and very considerable brains. Bossuet, Voltaire and Kant had, on the contrary, small faces and large brains. Soemmerring errs also in saying that the skulls of women are larger in proportion to their face than those of men. Moreover, in many animals this proportion is evidently incorrect; for the face of the sloth and seal is, proportionally to their brain, smaller than

that of the stag, horse and ox; yet no one will maintain that the former animals exceed the latter in intellectual faculty. Finally this proportion is not at all applicable to birds, as Cuvier himself has observed.

Plato in ancient times, and Bichat and Richerand in our own days, have maintained that there is a proportion between the intellectual faculties and the length of the neck. According to them, the intellectual faculties are smaller the longer the neck is, because the brain is more removed from the heart, and consequently is less excited by the blood. This assertion is too evidently opposed to all natural history and physiology to render necessary any endeavour to demonstrate its falsehood.

IV. On the Cerebral Parts, compared with one another.

The cerebral parts have been compared with each other, in order to ascertain their functions. Cuvier accordingly says * that it is possible to determine the exact proportion of the brain to the cerebellum; because no change of health produces any influence upon the cerebral mass; and he has composed several tables relative to this object. He there admits the proportion of the cerebellum to the brain, to be in man as one to nine, in the Saïmiri as one to fourteen, in the ox as one to nine, &c. Now even these few examples prove that the intellectual

* Loc. cit. p. 152.

faculties cannot be measured according to the proportion of the cerebellum to the brain; for, by this hypothesis, man and the ox must belong precisely to the same order. If also, according to the opinion of Malacarne, the cerebellum were the organ of understanding, the Saïmiri ought to have more of this faculty than man; if, according to our doctrine, the brain be the organ of feelings and intellectual faculties, the Saïmiri ought to have less of these than the ox; and if the hypothesis of Cuvier were true, the ox should have as much intelligence as man has.

It is not necessary that every part of the brain should always participate in the healthy and diseased state of the rest of the body; for, why should not that happen with the cerebral parts, which happens in other organs: any sense, or any viscus, may fall into disease, while the rest of the body is in health. In the same way, each cerebral part singly may be diseased. Even in the supposition, however, that all cerebral parts are influenced equally at the same time, by the healthy or diseased state of the body, it may still be asked, whether there is a determinate proportion between the brain and the cerebellum, and between the particular parts of the brain. The answer must be affirmative in one respect, and negative in another. The constituent parts of one organ are in proportion to each other; as the cineritious and white substances, the different apparatus of increase, the ganglia, the number of fibres which spring out of them &c. The different cerebral systems, however, which constitute the particular organs, and manifest the determinate faculties, are

in no constant proportion to each other. There are large brains joined to small cerebella, and *vice versâ*. The cerebellum of young persons is smaller in proportion to the brain than that of grown-up persons. Sometimes one, sometimes another part of the brain,—sometimes the forehead, sometimes the posterior part, is most developed. The proportions of the cerebral parts to each other are the more varied the greater the number of the particular parts. Hence the almost infinite variety of size and form of the head in the human species. Soemmerring, therefore, errs in saying that in sound brains not only the position and mutual connexion of all cerebral parts is invariable, but in the brain of man no considerable deviation relative to form and size is observed.

V. Anatomy.

Many natural philosophers have expected to succeed in pointing out the organs of the intellectual faculties by means of the anatomy of the human brain in particular, or at all events by comparative anatomy in general. It is also pretty generally believed that our new physiology of the brain is the result of its anatomy. Here, therefore, I shall make some reflexions on human anatomy in particular, and on comparative anatomy in general. There are, then, very few cases where the structure of any part indicates its function; and the opinion that this is the case is never more than conjectural. Before the motions of muscles were observed, it was impossible to infer from their structure that

they were contractile. The structure of the heart was known a long time before its function was discovered. The deepest perspicuity would not, *à priori*, have attributed the smell to the pituitary membrane of the nose, the taste to the nervous papillæ of the tongue, the sensation of light to the optic nerve, &c. Who, in seeing the structure of the stomach, could conjecture its digestive power? Who, from the structure of the viscera, could decide that the liver secretes bile, the kidneys urine? Who, from the structure and form of the nerves, can determine what kind of impressions they propagate?

It is the same with the brain. Let the direction of its fibres be known; and let anatomists distinguish their greater or less consistence, their more or less white colour, their different size, length &c. what conclusion as to the functions can they draw from these circumstances; None? Moreover, it is known that in plants the functions are extremely different, even when it is impossible to perceive any difference in their organization, which however must be different because the effects produced by it are so. Thus it is certain that the anatomical knowledge of any part does not indicate its function; and it is therefore necessary to have recourse to other means in order to discover it. On this account, the physiology of any part often precedes its anatomy. Thus it was generally known that we see by means of the eyes, before anatomists were acquainted with their structure. If indeed it were possible to determine the functions of the organization according to its structure, we should no

longer have occasion to refute many errors; to show, for instance, that the moral sentiments do neither result from the viscera or nervous plexus and ganglia of the abdomen, nor from the temperaments &c. Many organs of the brain however were discovered before its structure was demonstrated; and these discoveries might have subsisted for many centuries without the structure of the brain being known.

When I say, however, that the function of any part is not discovered by a knowledge of its anatomical structure, I am far from maintaining that the structure of any part has no relation to its function. The structure of the heart indeed has not shown its function, yet its structure is still in relation to its function; and it is the same with all the parts of automatic and animal life. A physiological system of the brain would be necessarily false, were it in contradiction to its anatomical structure. If an anatomist can prove that all nerves are only prolongations of the brain; that they terminate at one central point; that there is no difference between the brains of different animals though their faculties are different; that all parts of the brain increase and decrease simultaneously; that there is no difference between the brain of an idiot from birth, and that of a person endowed with great talent: in one word, if an anatomist demonstrate that the structure of the brain is in contradiction to physiological principles, or *vice versâ*, he will undermine and annihilate our whole doctrine with all its consequences. Thus there is some relation between the structure and

function of organic parts; yet the structure of any part seldom indicates its function.

Let us now examine whether comparative anatomy can determine the functions of the brain. At first sight, it seems that comparative anatomy ought to afford important results; but there are, in this respect, obstacles which it is impossible to overcome. Of these the first is, as I have just said, that it is impossible to determine the functions according to the structure of any part. Moreover, there is a great number of animals whose automatic life presents several organs of which man is entirely destitute; and we may conjecture that it is the same with animal life: but how can we conceive any function if we are not endowed with a similar faculty? Accordingly although it is of the highest importance to know the gradation observed by nature in perfecting the brains of animals in order to multiply and ennoble their functions, we must allow that, notwithstanding the most assiduous labour, comparative anatomy has shown only the mechanical form of different brains, but that these anatomical notions do not at all determine the functions of the cerebral parts.

There was not, then, any principle to enable anatomists to determine whether the same parts exist in different animals or not; and different parts were denied or admitted by them according to their similar or dissimilar form. The nerves of insects, crustaceous animals and molusca, are by them derived partly from ganglia, partly from the brain; but, according to our anatomical

principles, no nerve can be derived either from another nerve or from the brain. Every nerve has its own origin; and we call brain the nervous mass, which *is joined* to the nerves of motion and the five external senses, and by means of which the moral sentiments and intellectual faculties are manifested.

In the lower animals, it is extremely difficult, if not impossible, to determine whether there be a particular cerebral mass, which is intimately united to the organs of the nerves so that they seem to form one whole, of which the parts cannot be demonstrated; or whether this mass belongs entirely to the nerves of the five external senses, so that the external impressions are perceived without a brain. In fishes and reptiles, the nervous mass, situated in the skull, is divided into several ganglia: the anterior pair of these ganglia engenders the olfactory nerve; and behind this pair are the hemispheres of the brain, which are small, and composed of fibres whose functions are unknown. In birds, the hemispheres of the brain are more considerable than in the animals of lower orders, but they do not yet present convolutions. We have rectified the error of all anatomists, according to which the brains of this class are said to be destitute of the commissures, thalami and corpora striata. The cerebellum of birds is single, and consists of semicircular rings. In viviparous animals, the cerebellum ceases to be single: it has lateral parts. The brains of small quadrupeds, as of mice, rats, squirrels &c. present a smooth surface without convolutions. Cuvier

however is wrong in saying that the brains of the rodentia in general have no convolutions, for in the beaver the convolutions of the brain are very distinct. In the greater number of quadrupeds, the brain presents distinct convolutions; but neither in birds nor in quadrupeds has the function of any cerebral part been pointed out.

According to Cuvier, the posterior lobes of the brain are wanting in mammalia, except in monkeys; and he supports this opinion by the observation that their cerebellum is not covered by the brain. This conclusion, however, is very incorrect. It is indeed true that their cerebellum is not covered; but this circumstance results from the horizontal position of quadrupeds. The presence of posterior lobes cannot be denied, because their size and form are different in different animals; otherwise the cerebellum and the anterior and middle lobes ought also to be denied. Nay it does seem to me that in animals the anterior lobes and lateral convolutions of the brain are proportionally much smaller than the posterior lobes; for, while the posterior convolutions spring out of the pretended optic thalami, these are proportionally much larger in animals than the external half of the corpora striata. Consequently the anterior and middle lobes of the brain of animals do not present a greater analogy to those of man than the posterior lobes. It is therefore to be observed that in general the position and form of the cerebral parts do not constitute the essential proof of their existence. In man, the ganglion of the olfactory nerve is covered by the anterior lobe

of the brain; while in animals this ganglion lies before the convolutions; and the olfactory nerve of man is separated from his brain: while in the greater number of animals it is united to the anterior convolutions &c.: but are the anterior lobes therefore wanting in animals? Moreover, there are even men whose cerebellum is not entirely covered by the posterior lobes; but these lobes nevertheless exist, and are only smaller than in others. Thus the posterior lobes may be smaller in different animals, but the whole arrangement of their brain, the cavities of the hemispheres, the diverging and uniting fibres, &c. afford proofs of the existence of the posterior lobes as clear as those of any other cerebral part. Finally, animals manifest the same functions which are performed by the posterior lobes of the brain of man; and consequently we must also conclude physiologically that the respective organs exist.

Cuvier says also, in contradiction to himself, that the brains of quadrupeds have the same parts as the brain of man; and by this he can only mean the larger portions, as the cerebellum, the pons Varolii, the thalami, corpora striata, corpus callosum, and anterior and middle lobes. This assertion therefore must yet be rectified in another respect. The general type of the brain and cerebellum of man and animals is indeed the same; but they present many modifications; and many parts of the brain of man are wanting in the brain of animals. This may be illustrated by analogy. All plants and trees have certain common parts, as roots, stalk, trunk,

boughs, branches, leaves; but can we say that all vegetables have the same parts? The general type is the same in all; but their modifications are infinite. The laws of vegetation are the same in all parts; but the elements, submitted to these laws, are different. In the same way, the laws of the nervous system are the same in respect to origin, increase and perfection. From the brain of insects to that of man there exists the same type; yet the brain presents as many modifications as nature intended to produce different functions. For this purpose the common parts are more or less complicated.

Cuvier thought that there was some proportion between the size of the tubercula quadrigemina and the food of animals. According to him, the anterior pair of these tubercles is larger in herbivorous animals, and the posterior in carnivorous ones. The wolf and sheep however have the nates larger than the testes; the assertion of Cuvier therefore falls to the ground. I pass over various other errors believed and propagated by comparative anatomists. From these considerations, however, I think it evidently results that comparative anatomy has not, any more than human anatomy, advanced the physiology of the brain.

VI. MUTILATIONS.

Several natural philosophers have endeavoured to determine the functions of the brain by its mutilations. They therefore cut away various parts in order to see what faculty should be lost. But, in the first place,

these means could not be accurately employed, and must therefore be entirely useless. They could not be accurately employed and were imperfect, because the duplicity of the organs was overlooked. The structure, also, of the brain was unknown; and therefore the mutilations were made horizontally, while the direction of the fibres was vertical. —(*Pl.* III. *fig.* 1 & 2). Moreover, the special faculties of the mind were unknown, and the mutilated animals were said to manifest all faculties, if they manifested the common and general faculties.

These means were not only altogether useless under such circumstances but they can at no time serve to determine the functions of the brain; for the organs are not confined to the surface: consequently every organ ought to be cut away, on both sides, from the surface to the medulla oblongata; and such a wound would kill any perfect animal. Let us, however, even suppose that the animal could survive such mutilations: how should it manifest a sensation of which it has been deprived? and how should it indicate the want of this sensation? Moreover, such operations are too violent, and the animals might retain several faculties without the power of manifesting them: a bird whose brain is in any way violently injured is not likely to sing, or to build a nest &c. Finally, the derangements of parts, which are affected by sympathy, are sometimes more sensible than those of parts which suffer primitively or idiopathically. A head-ach is often the sole result of something indigestible in the stomach; and this takes place without any feeling of pain in the stomach

itself. Hence it is impossible to determine the functions of the cerebral parts by their mutilation.

Sir Everard Home,* in his Observations on the Functions of the Brain, read at the Royal Society on the 26th May, 1814, seems to trust to a peculiar means of determining the functions of the cerebral parts. He says "the various attempts, which have been made to procure accurate information respecting the functions that belong to individual portions of the human brain, having been attended with very little success, it has occurred to me, that, were anatomical surgeons to collect in one view all the appearances they had met with, in cases of injury to that organ, and the effects that such injuries produced upon its functions, a body of evidence might be formed, that would materially advance this highly important investigation." He then informs us that he has brought together certain observations, "stating them as so many experiments upon the brain, with the conclusions which tend to elucidate this particular inquiry."

Let us first hear his observations. We read † "that in the torpid state, commonly attendant upon any violent shake being given to the brain, the senses are so much impaired, that little information can be gained respecting the effects produced upon the internal organs;—that a *coup de soleil* is sometimes accompanied by delirium, loss of speech and the power of swallowing;—that blood extravasated in

* Phil. Trans. for the year 1814, Part II. p. 469.

† Sect. ii. p. 477 &c.

the lateral and third ventricles was attended by repeated fits of vomiting and coma:—that coagulable lymph spread over the union of the optic nerves, the pineal gland and tuberculum annulare, was followed by permanent contraction of the muscles between the occiput and vertebræ of the neck, dilatation of the pupils, and a great degree of deafness;—that the formation of pus under the dura mater covering the right hemisphere was accompanied by delirium succeeded by coma;—that a tumor in the substance of the posterior lobe of the brain was attended with derangement of the functions of the stomach and bowels, and with double vision;—and that a deep wound into the right anterior lobe of the brain, attended with inflammation and suppuration, produced no sensation whatever, the senses remaining entire, and the person not knowing that the head was injured. In a case, also, in which the tuberculum annulare had become so hard as with difficulty to be cut with a knife, a considerable quantity of earthy particles having been intermixed with the medullary substance of the crura and other parts of the cerebellum, and the cerebrum and upper part of the cerebellum being unusually soft, the effects were, that the boy had been an idiot from birth, never walked, spoke and understood what was said, often went three days without food, and so on."

I suppose Sir Everard Home did not intend to state such facts as quite new and unobserved; for every one who is but half acquainted with the history of the healthy and diseased state of the brain knows, that many authors have related similar facts. We learn however from their writings that similar

affections of the brain have often produced no perceptible derangement in the mind. I only maintain, that these means are quite unfit to point out the functions of the brain, and that any hope of it from such a source is in vain; and I may support my opinion by the observations of Sir Everard Home himself. He accordingly speaks of a body of evidence which might be formed, and of conclusions which tend to elucidate this particular inquiry, but he has not drawn even one inference. In the various pathological affections of the brain, he has observed head-ach, giddiness, faintness, loss of memory, want of sleep, delirium, mania, depression of spirits, melancholy, apoplexy, idiotism, hissing noise in the ears, deafness, blindness, loss of speech, irregular pulse, stupor, the mouth drawn to one side, numbness of the arms and legs, spasms in the lower extremities, stumbling in walking, pain between the shoulders, nausea, retching, slow action of purgative medicines, vomiting, convulsions &c. Is Sir Everard Home then inclined to draw the inference that the brain is the organ of these symptoms, or of the states which are opposite to them. This is I think sufficient to show an intelligent reader that, in this way, we never shall be able to determine the peculiar functions of the cerebral parts.

VII. OUR MANNER OF DETERMINING THE FUNCTIONS OF THE BRAIN.

In every function, we may distinguish its energy or quantity and its modification or quality. It is very difficult to examine the modifications; but

more easy to distinguish the different energy of the functions. Let us then examine on what conditions the energy of the functions of the brain depend. There is a general law that the energy of the functions of any organic part depends on its size and on its organic constitution, that is, on its extensity and intensity. It is also certain that in order to judge of the degree of activity of the faculties, it is necessary to consider, besides the extensity and intensity of the organ, the exercise of every faculty, and the mutual influence of the faculties upon each other. Now among these conditions, the most easy to be observed is the size of the organs. As, then, the energy of functions depends on the size of their organs, and as the size of the organs is most easily distinguished, it results that these means are the most proper for the discovery of the functions of the brain.

There is indeed throughout all nature a general law, that the properties of bodies act with an energy proportionate to their size. Thus a large loadstone attracts a greater mass of iron than a small one of a similar kind; the fermentation of the same fluid is more energetic if its quantity be more considerable; and a great muscle of the same kind is stronger than a small one. If the nerves of the five external senses be larger on one side of the body, the functions also are stronger on that side. Why should it not be the same in respect to the brain? Those persons, however, who assert that we neglect the internal organization are entirely wrong.

In order to judge exactly of our mode of proceeding, it must be considered that we do not endeavour

to determine every degree of activity of any cerebral part, but *only* the nature of its functions; and to this end its size is sufficient. Gall, though he mentioned this difference in his lectures, was not careful enough to insist on it. The internal constitution, though very important, is not easily distinguished; yet on account of its influence, we never compare the individuals of different kinds, not even those of the same species; but in order to obtain the first notion of any organ, we confine our observations to each individual independently of others. I admit even the possibility that, in the same individual, the internal constitution of the different parts of the brain may vary, in the same way as the optic nerve may be more irritable than the auditory or the olfactory. It may nevertheless be observed that a great difference in the size of the cerebral parts produces a difference in the manifestations of the mind. Indeed the divers parts of the brain are differently developed: one is larger, another smaller; and, according to a general law, we are convinced that the functions of the parts, which are much developed, manifest themselves with more energy, while smaller organs are correspondingly less active.

There now arises the question whether it is possible, during life, to distinguish the developement of the cerebral parts in man and animals? The question Is it possible to know the size of the cerebral parts by the form and size of the head? must be distinguished from another question, namely, What is the cause of the form and size of the head? This latter is important in respect to physiology in general,

but it is indifferent in respect to the practical part of the organology of the brain, which requires only the possibility of knowing the size of the cerebral parts without examining the causes of their developement. To the first question we must answer, that there is, in this respect, a great difference between different kinds of animals; that it is impossible to compare animals with animals, or animals with man; that it is even necessary, in animals and in man, to consider the different periods of life; that in mankind in particular it is sometimes possible to determine the organs of the brain with exactness and facility; that several other circumstances render it difficult; and, finally, that in certain cases it is impossible. Let us therefore first enter into the examination of the cause which produces the form of the head.

CAUSE OF THE FORM AND SIZE OF THE HEAD.

I here speak only of mankind; but these researches, with regard to both the preceding questions, may be extended to every kind of animals. It is asked by some, whether it is the skull or the brain which determines the form of the head? and it may seem that the skull, which is hard, must determine the form of the brain, which is soft, rather than the brain that of the skull. In order to illustrate this question, I shall consider man both in his healthy and diseased state. After conception, the brain exists before it is confined by the skull. It is both then and subsequently covered by a fourfold membraneous coat: the pia mater, which closely adheres to the substance of the brain; the tunica arachnoides

or arachnoid coat, which has this name from the extreme tenuity of its texture; the dura mater, which consists of two separable membranes; and a cartilaginous membrane in which ossification takes place. This fourfold membraneous coat, enveloping the brain, exactly represents its external form.

The ossification begins at different parts, called points of ossification; and from these the ossification extends in a radiant direction according to the size and form of the cerebral parts to which it adapts itself. The elongations of the bony radiations are sooner or later aggregated, and constitute the individual bones, of which the regular and connected assemblage forms the skull. In new-born children, there are commonly eight bones, which contain the brain and represent its form and size: these bones are—two frontal, which latter commonly unite and form one bone, yet there are grown-up persons whose frontal bone is divided; two parietal, two temporal, one sphenoidal, one occipital, and one ethmoidal bone. These various bones have connexions called sutures or articulations; and when combined by them, they form the skull. In new-born children, in general, the approaching angles of the two frontal and two parietal bones are not yet ossified; but leave a membranous part called fontanel, a few inches higher than the middle of the forehead. The bones are, till this age, very thin, and most perfectly accommodated to the form and size of the cerebral parts. It may here be asked, whether any difference of brain and skull is already perceptible in the fœtus? Soemmerring has elucidated this subject: we have repeated the same observations; and it is

indubitable that the heads of fœtus are as different as those of grown-up persons.

Then happens birth; and it must now be ascertained whether the form of the heads of new-born children is changed by it; and it may also be inquired, whether it is possible for a midwife or accoucheur to give to the head an arbitrary form, by compressing it or by impressing certain parts of it? Before I answer this question, I must briefly consider some circumstances as to natural delivery. Sometimes, then, the head of the fœtus is retained during difficult birth; and in these cases the head is compressed. Nature however has taken particular care of the preservation of the brain enclosed in the cavity of the cranium: for the dura mater, which envelopes the brain, is attached to the skull more firmly than it is in adults, and prevents the edges of the bones from passing over each other; the prolongations of the dura mater, known under the names falciform process and tentorium, contribute equally to secure the parts of the brain; the bones themselves are flexible, elastic and articulated in their connexions; and the skull forms an arch, which of all forms offers the greatest resistance. The brain is also a living part, and its natural elasticity is supported by its continual rising and falling, produced by the circulation. Now the tumours which are commonly observed in the upper part of the heads of new-born children result from the accumulation of blood, the circulation of which is interrupted; but after a few hours or days the humours are absorbed, and the tumour disappears. Consequently

a transient pressure, which does not act very violently, does not change the primitive form of the brain. A violent compression will doubtless derange the organization; and a less violent but permanent compression, which changes the natural form of the brain, and hinders its developement, will always injure the manifestations of the mind. If such individuals do not become idiots, the manifestations of their faculties are at least deteriorated.

It happens sometimes that the bones of the skull do not at birth touch one another. In this case the head is compressed during birth, and the children die. This circumstance should be considered, when an unfortunate woman is accused of having murdered her child. It is also obvious, that though in the ordinary state great violence must be employed to compress the skull and the brain, yet in delivering the fœtus by means of the forceps, it may easily happen that the brain is compressed and the organs injured; and in this case the manifestations of the mind will be injured also. Thus from these observations, it follows, that in new-born children the size and form of the head depend on the brain.

It is objected that, in America, several tribes of savages give an arbitrary form to the heads of their children. I do not indeed pretend that such reports are false; but admit that engines of this kind, which are preserved as curiosities in cabinets, are employed with the intention of flattening the head, but I am not satisfied as to the effect which is attributed to these machines. I have seen seven skulls of Caraibes: they were low and laterally extended, particularly

at the temporal bones; yet every one presented some modification as distinctly as seven skulls of any European nation could do. I have, however, seen skulls of Europeans which were still lower: therefore this form of skull is not merely the effect of artificial pressure. Moreover, the upper surface of each of these Caraibean skulls was in different degrees vaulted, and therefore not all modelled according to the pressure of an equal board. It even seems to me that the account of this manner of flattening the head is refuted by itself: according to the preceding observations, great violence must be employed to compress the skull and brain; now this cannot take place from above, without an equal counterpressure from below, or from some other part; and if the pressure produce an effect, it must be precisely the same with the counterpressure. Hence I think that Americans, as well as Europeans, who endeavour to give an arbitrary form to the brain, only form an unreasonable expectation. It may be replied that the effect of pressure is evident from the feet of Chinese women: and I certainly do not deny the effect of pressure; but the feet of the Chinese are compressed on all sides; there is pressure and counterpressure, and their effect is every where visible. This may also be the case with the head, but I argue only against the incorrectness of observations, according to which the head is said to be depressed on one side alone. Since the publication of the first edition of this work I have on this subject heard reports from various gentlemen who had been on the island of St Vincent. They were all,

however in contradiction to each other, and I am still as uncertain respecting it as before.

There are still other considerations which support my doubt whether this configuration of the scull is artificial. Throughout Europe, the foreheads even of new-born children are higher and more prominent than those of adult Caraibs. Hence, either Caraibs are born with foreheads so low and their farther developement is prevented by artificial pressure, or their foreheads are higher from birth, but are flattened or depressed by art. I have already shown that the latter opinion is improbable; and the former seems not better founded in observation. I have heard various reports as to the period during which the board is applied to these heads: one Gentleman told me, that children bear the machine only during six weeks: another assured me that, on the contrary, it is borne during six months, and according to a third it is continued during two years. Even, however, admitting the last period to be correct, I am not yet convinced of its pretended effect on the configuration of the forehead. At two years of age, the cerebral parts of the forehead have not yet acquired their full developement; the foreheads even of Caraibs, when adult, being certainly larger than when children. Now as, at certain periods, the constituent parts of the brain and skull, as well as those of the rest of the body, undergo a change, and as there is no pressure continued during after life, the future developement of the brain may unimpededly take place. Notwithstanding these observations, I still consider this question as of the highest

importance, and I certainly do greatly wish, that it were possible to prevent, by artificial pressure, the growth of certain parts of the brain.

I continue now the elucidation of the natural developement of the skull. By degrees it grows hard; and it may therefore be asked, whether the hard skull must yield to the softer brain? If we compare the skull of a child with the skull of an adult person, it is obvious that the skull of the adult is larger than that of the child; and consequently, that the skull increases in proportion to the brain. Moreover, all the cerebral parts do not increase simultaneously; and this partial developement is equally observed in the skull. The forehead, for instance, which at birth is narrow and flat, grows wider and prominent from the age of three months, till that of eight or ten years. After this period, the middle part of the forehead is in proportion to the other parts less developed. The neck of children is very small, for the cerebellum, whose developement takes place very late, is situated in the inferior occipital fossæ; but, in proportion as it increases, the skull grows prominent externally. Such also is the case with all other cerebral parts which increase successively.

Some explain the growth of the skull by the action of the brain in a mechanical way. This explanation however is quite incorrect; for if the brain were exposed to the least compression, its functions would be deranged. The phenomenon of growth results from the change which our body, as well as every organic being, unceasingly undergoes. The

parts of our body are continually decomposed and composed again, the matter which constitutes our body being evacuated by excretions, and replaced by other matter, furnished by alimentation. Like all other parts of our body, the brain and skull are submitted to this decomposition and composition; and, according to the natural law established between the skull and brain, the brain at all ages commands the directions in which the bony mass is deposited in order to form the skull. If the whole brain, or some parts, increase or decrease, the ossification of the skull follows always the size and form of the brain.

It is the case not only in respect to the head, that a hard part is modelled according to the form of a soft one, but it is universally true that the hard parts which inclose soft ones are all modelled according to the form of the softer parts. If in consumption, one side of the lungs alone be affected, the corresponding side of the thorax is diminished. If the eye of an animal be pushed out, the orbit becomes smaller; and if, on the contrary, an eye grow carcinomatous, the orbit is extended in proportion as the eye-ball enlarges. In the same manner does the skull follow the different size and form of the brain.

Let us now consider that which, in old age, happens with the brain and skull. Then, the cerebral parts diminish by degrees; the convolutions, which are plump and well nourished in young persons, sink down and diminish in size; and they are no longer near to each other. In the same proportion as the

brain or its parts decrease, is the internal table of the skull changed, according to the law of nutrition of which I have just been speaking. Ordinarily, however, the external table of the skull preserves in old age the same size and form which it had at the age of maturity. At that period, therefore, the skull, if the brain diminish in size, becomes thicker; and the two tables are sometimes very distant one from the other. The superior portion of the orbit is commonly very thin and transparent, yet it sometimes happens in old persons, whose brain has diminished in size, that even there the two tables are separated and very distant from each other. Throughout the skull it is the external table which preserves its position, while the internal follows the size of the brain, and greatly diminishes the general cavity. Thus from this exposition of ages, in respect to the changes produced in the brain and skull, it results that the form of the skull is always the consequence of that of the brain; that from the beginning of ossification till death the internal table of the skull is moulded according to the brain; and that in old and decrepid age the two tables are often separated, and the skull is thicker than it was at the age of maturity.

The diseased state of the brain also proves our assertion relative to the form of the skull. There is no skull without brain; for if monsters be born without brain, their skull also is wanting. If in idiots from birth the brain be hindered from increasing, the skull remains small (*Pl.* IV. *fig.* 1); and if, on the contrary, the brain be distended by

water accumulated in its cavities, the skull participates in this extension, whether it be general, or exist only in particular places.—(*Pl.* V. *fig.* 1 & 2.) The resistance of the brain is also demonstrated by wounds of the skull, wherein bits of bones, depressed by external violence, are replaced by the action of the brain. Moreover, this resistance of the brain is proved by fungus of the dura mater; for fungous tumours act upon the skull, destroy and pierce it. All therefore concurs to prove that the form and size of the brain regulate the form and size of the skull. I do not, however, deny that in some diseases of the skull, the ossification may be primitively altered, and the developement of the brain injured by the influence of the skull; but in such cases the functions of the brain are unavoidably deranged.

It is an error to suppose that the impressions which correspond to the convolutions, and those which the blood-vessels of the dura mater make on the internal surface of the skull, are the result of their mechanical pressure. The grooves of the internal surface of the skull are the effect of the absorbent vessels, and the impressions called digital take place where the dura mater is very thin: this in man and in the greater number of animals, as the roe, sheep, cat, dog &c., commonly happens at the basis of the skull; yet it sometimes extends all over it, as in individuals who die of comsumption, and whose dura mater had become particularly thin.

Several other opinions relative to the size and form of the head are quoted as objections to our

assertion, that the brain determines the form of the head. A great number of anatomists and physiologists maintain that the form of the head is modified by the muscles, and that several elevations attributed to the brain are the effect of the action of muscles attached to the outside of the skull. There are indeed bony tumours on the outside of the skull; but they are neither the effect of the brain nor of muscular action: these elevations are of different forms, and are destined by nature for the insertion of the muscles. Here however I speak only of the form of the skull, or of those greater protuberances, which we consider as the result of the brain. Now those who assert the influence of the muscles upon the form of the head do not agree about their effect: some maintain that the muscles depress the organs, while others think that they produce elevations. It is easy however to prove that the muscles have not the slightest influence on the form of the skull.

If the muscles really did determine the form of the skull, they ought obviously to act in the direction of their insertion; and the protuberances of the occiput, and of both sides of the head, ought to be directed downward, not backward and sideward. Under this supposition there ought also to be a proportion between the size of the protuberances and the strength of the muscles inserted into them; but on the contrary it often happens that large protuberances correspond to weak muscles, and *vice versâ*. Negroes indeed have larger and stronger masticating muscles than Europeans, and the heads of the former are narrower at the temporal region than those

of the latter. Hence there are anatomists who think that the muscles compress the skull. In opposition however to this, we see that while the lower region of the head, covered with muscles, is in children narrower than the upper, it is quite the contrary in adult persons. We have observed Europeans who had very weak masticating muscles, and whose heads were yet narrow, and others who had strong muscles and whose heads were large. Such also is the case with animals. The heads of lions, tigers, hyenas and dogs, are much narrower at the temples than those of oxen, horses, stags &c.; yet the former have stronger masticating muscles then the latter. While the badger has strong muscles and a narrow head, the seal has a large head and weak muscles; but other animals, as already observed, have strong muscles and a large head.

Moreover, according to the hypothesis which I am combating, the muscles ought to act upon the external table of the skull, which ought to recede from the internal; yet, on the contrary, they are nearest at the places where the muscles are inserted, so that there the skull is transparent; while, also, both tables of the skull are most distant from each other at the places where no muscles are inserted. Sometimes indeed it happens that the skull grows thick even in young persons; but this thickening always takes place at the internal surface, as is evident from the spina cruciata of the occiput. If in old persons, or in chronic diseases of the brain, the skull grow thick, and if both tables be distant from each other, the internal plate always diminishes the cavity of the

skull, while the external plate preserves its usual direction.

According to that hypothesis the protuberances or depressions of the skull ought to be not only in proportion to the strength of the muscles, but also to the time during which the muscles have acted—circumstances which, however, are not observed. Moreover, the protuberances or depressions produced by the muscles ought to be conformable to their points of insertion; but what muscle can produce the form of the organs we have indicated, as, that of construction, of covetousness &c.? The form, however, of the protuberances always corresponds to the form of the organs.

Besides, there are many protuberances where no muscles are inserted, as those which indicate firmness, veneration, benevolence, self-esteem and circumspection; but where, on the contrary, they should be depressed by the pressure of the aponeurotic expansion of the occipito-frontal muscle. What muscle, moreover, can possibly draw the skull upwards in the direction of these prominences? In many animals, as in the hog, ox, elephant &c., both tables of the skull are separated from each other, but the cells are irregular, and never correspond to the insertion of the muscles. If in animals the muscles be placed in the interior of the skull, as in the tortoise, the head ought to be small and contracted; and the orbit of the higher animals ought by degrees to grow smaller, on account of the muscles, which are attached to its internal surface. Neither, however, of these circumstances occurs.

Finally, in fœtuses, muscles do not act with strength enough to determine the form of their heads, which however are as different as those of adult persons. From all these proofs it is therefore evident that the muscles do not at all determine the form of the skull.

Professor Ackermann, at Heidelberg, thought that the frontal sinuses of man, and the cells between both plates of the skull of animals, were produced by the inspiration of the air, which, according to him, gradually distends them. He maintained that, from this cause, individuals who are very active, and who exercise themselves much in walking and running, have larger sinuses; and that animals which live in the open air, and which inspire a great deal of it, present the greatest number of cells. Several considerations, however, prove the error of this assertion, which is not grounded upon experiments, but only hypothetically advanced.

The possibility of inhaling the air supposes a space already formed between the two tables of the skull; but how has this space first been produced? Let us admit that the air is drawn into the sinuses, what then may be its action? Ackermann imagines that the air is warmed, and distends the cells by its expansion? Is it not, however, more probable that the air would, by its state of expansion, go out by the aperture through which it entered, instead of acting with violence against the bony sides of the cells? Even in the supposition that the air acts against the sides of the cells, ought not the cells to be distended like bladders? why then are they angular? Moreover,

all the cells of the skulls of animals do not communicate with each other. There are also cells in the interior of other bones; for instance, in the bones of the extremities, in both maxillæ, even in the fœtus: why then should not cells be originally formed between the tables of the skull?

Finally, the opinion of Professor Ackermann is a mere supposition. We know individuals who, leading a sedentary life, have great sinuses, and others who, living always in the open air, have no sinuses. Such also is the case with animals: the ox and hog have larger cells than the stag, roe and reindeer; the lazy owl has greater cells than the active eagle; and the skulls of the stork, wild duck, wild goose and swallow have no cells, notwithstanding their steady and rapid motions. The opinion therefore of Ackermann, that the inspiration of the air produces the frontal sinuses and the cells between the two plates of the skulls of animals is erroneous and falls to the ground.

Hufeland, of Berlin, made the observation that in countries where the inhabitants bear burdens on the head, its form is probably changed and modified. Now in the first place, very young children do not bear any burden on the head; and consequently when they begin to carry burdens their skulls are closed and offer resistance—a resistance which is greater on account of the vaulted form of the bones; and even the brain itself contributes to it. Secondly, those who bear burdens on the head make use of cushions or rolls, so that the burden cannot press on the top of their heads, but on the lateral parts; and consequently the head cannot be flattened by these

means. Moreover, they do not continually bear burdens: their heads are free from them during the greater part of their lives, and in these intervals they might increase. Finally, this opinion is not only refuted in theory, but also by experience. We have examined many individuals who have borne burdens on the head during their infancy and later age, and whose heads were yet much higher than the heads of other persons who never bore any burden.

Walter of Berlin, Rudolphi, and several others have maintained that the formative power determines the ossification and the shape of the skull. I have already said that the ossification of the skull is not the result of the brain: the bony mass, however, is secreted by particular vessels, and according to the state of these blood-vessels, the internal constitution of the skull is modified: it is nevertheless certain that the bony mass is deposited according to the form and size of the brain.

Thus from all that I have said with regard to the skull, it follows that its form is the result of the form of the brain. Let us now examine the circumstances wherein we may certainly and easily distinguish the size of the cerebral parts. I shall afterwards mention various difficulties which must be removed; and, finally, consider the cases wherein it is impossible to determine exactly the size of the brain and its parts.

POSSIBILITY OF DISTINGUISHING THE SIZE OF THE BRAIN.

I have already mentioned that in order to promote the practical part of the physiology of the brain, a knowledge of the cause of the size and form of the

head is not essential; and that, in this respect, it is only necessary to distinguish the size of the brain and its particular parts by the exterior of the head. This *knowledge* requires a precise idea of the difference between the size of the head and that of the skull. Now all the dimensions of the skull are much smaller than those of the head, but in its details the whole shape of the head is preserved. It is with such a restriction only that we can make use of antique busts and heads; for it is certain that the antiques, being colossal, do not present the natural size of the head. It is nevertheless remarkable that their form and size are very different: what difference, for instance, between the heads of women and men; between the heads of gladiators, sacrificators, philosophers, great poets, and generals?

In respect to the size and form of the head, it is also necessary to know the common size of heads, whether in general or in their different regions, in order to distinguish at the first view whether any head is too large (*Pl.* V. *fig.* 1 & 2), or too small.—(*Pl.* IV. *fig.* 1.) It is also necessary not to confound bony excrescences and irregular elevations with those protuberances which express the developement of the organs. Moreover it is necessary to know those less important bony protuberances which have particular destinations, as the mastoid process behind the ears, the spina cruciata of the occiput, the zygomatic process before the ear, &c.

It is from experience perfectly certain that the skin, muscles, and coverings of the head in general, do not prevent us from distinguishing the form of the skull;

and that the dimensions of the skull are only smaller than those of the head. Still it is to be examined whether the size and form of the skull indicate those of the brain? To this end I repeat, that the skull is composed of two tables, one external and the other internal; and that between these two tables a cellular spongy mass, called diploe, is deposited.—(*Pl.* III. *fig.* 1 & 2). These two tables are scarcely perceptible in children, but are distinct in adults, though their distance from each other is not very considerable. In general from birth till the period when the brain begins to diminish in size, it is not only possible but easy to determine the size of the brain by examining that of the skull; for there never is any empty space between the skull and the brain, and the two tables are not sufficiently distant in any way to invalidate our assertion.

It is indeed objected that both tables are not parallel, and that for this reason it is impossible to measure the size of the brain and its parts according to the size and form of the skull. This objection however falls to the ground as soon as our method is known. It is not necessary to appreciate any minute difference of size, in order to determine the developement of the organs. These occupy extensive surfaces, and present very different sizes from the lowest to the highest degree of developement.

It is also to be considered that we only intend to distinguish the size of organs, and that it is essential not to confound this idea with that of protuberances; or rather it is necessary to bear in mind their relations to each other. If indeed one organ

be much developed, and the neighbouring organs very little, then the developed organ presents an elevation or protuberance; but if the neighbouring organs be proportionally developed, then no protuberance can be perceived, and the surface is smooth. Now this may happen whether the organs are much or little developed. Every individual has all the organs; and it is only to be determined whether the whole brain, or one or more parts, are more or less developed. It is also to be remarked that, in order to determine the developement of the organs, it is not always necessary to touch the head: in many cases the eye is sufficient. It is even more easy to distinguish the size of the organs, situated in the forehead, by sight than it is by touch. It is necessary to touch only those organs which are covered with hair.

Finally, it is to be considered that the developement of the organs is different in respect to their length, and in respect to their breadth; for the fibres which compose the organs are sometimes thick and short, sometimes thick and long, sometimes slender and long, and sometimes slender and short. This difference of developement must produce some difference of the manifestations of the faculties. My observations are not yet matured enough to determine this point. It seems that long fibres produce more activity, and thick fibres more intensity. From all this it follows that the size of the brain in general, and of its parts in particular, may be determined from infancy to the commencement of decrease, and consequently at those ages in which

the faculties are the most active. Let us next consider the difficulties in the physiology of the brain, which must now be removed.

DIFFICULTIES OF DISTINGUISHING THE SIZE OF CERTAIN PARTS OF THE BRAIN.

Plattner of Leipzic has said, that it is impossible to determine the organs situated in the middle line of the head, on account of the longitudinal sinus: but this receptacle of blood, or this canal, is not large enough to hinder us from distinguishing the size and developement of the neighbouring organs, the elevations of the organs being much larger than it. Sometimes the hemispheres of the brain are a little separated in the middle line along the longitudinal sinus; and this happens most commonly between the organs of philoprogeny, of self-esteem, and of perseverance. Then, indeed, there is a groove on the outside of the head; but he who knows organology cannot be misled by it.

Those who begin to practise our doctrine find another difficulty in the frontal sinuses; and many adversaries even maintain that it is impossible to determine the developement of the cerebral parts situated behind it. In consequence of the frontal sinuses, say they, the organ of space cannot be distinguished. The developement of this organ, however, and that of the frontal sinuses, present quite different forms: the frontal sinuses only form a bony crest, while the isolated protuberance, indicating the particular developement of the organ of space, is round and large.

Sometimes the organ of space is very considerable, and at the same time there are frontal sinuses: then the bony crest is perceived, and this part of the forehead is at the same time prominent.

The cerebral parts, situated behind the orbits, require some exercise on the part of the physiognomist, in order to be exactly determined. Their developement is discoverable from the position and configuration of the eyes, and from the circumference of the orbits. It is therefore necessary to examine whether the eyeball is prominent or hidden in the orbit, and whether it is placed sideward, or outward. According to this position of the eyeball, we may judge whether the part of the brain, which is situated against a corresponding part of the orbit, is more or less developed.

It may be questioned whether all organs reach the surface, so as to enable us thus to determine the organs of all faculties of the mind by the size and shape of the head? There are indeed many convolutions in the middle line of the brain between the two hemispheres; and there are also some others at the basis of the brain, and between the anterior and middle lobes, which therefore do not reach the surface of the skull; but it seems to me that a great part at least of every organ lies at the surface, and that, if one part of any organ be well developed, the whole participates of this developement. The whole cerebellum does not touch the skull, yet it is possible to determine the size of the cerebellum according to that part of it which reaches the surface. Accordingly the cerebral parts, which are, as above

noticed, situated in the middle line between the two hemispheres, seem to be proportionate to the superincumbent organs: at least I have always observed a proportion in the vertical direction between these cerebral parts. Now as there is a proportion between the constituent parts of any organ, and as the other organs have been determined although all their parts do not reach the surface, it appears to be possible to determine all the organs, though the whole of their fibres do not terminate at the surface.

To beginners however the greatest difficulty is, when any organ is extremely developed, and proportionally pushes the neighbouring organs from the places which they commonly occupy. There are two cases of this kind; in which either one single organ is extremely developed, or several are very voluminous, but in such proportion that the surface is almost smooth. In the first case, the difficulty is not very great, for every organ has its own form and its particular direction; and therefore it is only necessary to look at the most prominent point which corresponds to the middle of every organ. It requires more exercise when several neighbouring organs are almost equally developed; but even then, the most prominent point, and the direction of the protuberance, facilitate our examination and decision.

Against organology it is farther objected, that though it be possible to measure the size and form of the brain by the form and size of the head, it is yet impossible to determine the size of the organs by the size of the head or skull, because the organs

are not confined to the surface, or to the convolutions of the brain. It is indeed true that the organs are not confined to the surface of the brain: they extend from the surface to the great swelling of the occipital hole, (medulla oblongata), and probably include even the commissures; for the whole mass of the brain constitutes the organs: but as the peripheric expansions of the five senses indicate the developement of their respective nerves, so the convolutions of the brain denote a larger or smaller developement of the whole cerebral mass. This will be understood by analogy: animals which have a large external apparatus of smell, large nostrils, large turbinated bones, a large expansion of the pituitary membrane, and consequently a very considerable nervous expansion, have the whole olfactory nerve very much developed; and it is possible to measure the developement of the nerve in general according to its peripheric expansion. In the same manner the retina, or the expansion of the optic nerve, is in proportion to the nerve itself; and of course such also is the case with the organs of the moral sentiments and intellectual faculties. The convolutions then are the peripheric expansions of the internal nervous bundles, and they are therefore in proportion to them, so that it is possible to determine the whole mass of the organs according to the convolutions. Though therefore the organs are not confined to the surface of the brain, and though only their peripheric expansions are there perceived, it is still possible to determine the size of the whole organs.

IMPOSSIBILITY OF DETERMINING THE SIZE OF THE BRAIN.

It still remains for me to speak of those cases wherein it is impossible to determine the size of the brain in general, and of its parts in particular, according to the size and form of the head. If, then, the brain begin to diminish, it is impossible to determine its size. According to a general law of organic parts the brain decreases by degrees, and the convolutions which, at the age of maturity, were plump and prominent, sink down, and are separated from each other: in one word, the composition of parts is no longer equal to their decomposition; the latter prevails, and the size of the brain diminishes. Then it is that the external size and form of the head often remain the same, while the internal table of the skull follows the surface of the brain, and both tables are more or less separated from each other by the intermediate diploe. In this manner the skull of old decrepid persons of both sexes is commonly rendered thicker, more spongy, and less dense; the diploe being then not only more considerable, but the tables also less solid. Sometimes there are, in the skulls of old persons, parts which are very thin, while the rest remains thick; and sometimes the whole skull grows thin. This is evidently the consequence of the decomposition or absorption not being always equally strong at all places of the brain: its effects however, are most commonly observed in the middle of the parietal bones. It may be remarked that the least blow may depress such thin skulls of old persons, while a

much stronger blow would not have done to them the least harm at the age of maturity. Thus old and decrepid persons do not serve to confirm the doctrine of organology, because it is in them impossible to judge accurately of the size of the brain from the size of the head. Moreover, the organs do not continue to be very active at this age. It is therefore evident that, in order to establish the physiology of the brain, we must confine our observations to young and grown-up persons in the flower of their age.

Another circumstance which impedes our determining the size of the brain, according to the size and form of the head, is that which occurs in certain cases of chronic insanity. In this state, the brain diminishes in size as the other nerves do when long diseased; the internal table follows the size of the brain, while the external table preserves its usual position; and on this account the skulls of fools and madmen are often very thick; yet their texture is not very spongy, but hard and dense like ivory. It is indeed remarkable that a great number of madmen have the skull hard and dense like ivory, and extremely heavy. The skulls of many madmen are also thicker than usual, and even when they are not thicker, they are at least dense and heavy. This phenomenon is probably an effect of some alteration in the brain, and it furnishes a new proof of the influence of the brain upon the skull.

Sir Everard Home, in his observations on this object, errs in classing together depression of the skull by external violence and thickening of the

different portions of the skull. He has no idea of the diminution of the brain as the cause of the increased thickness of the skull; but always considers the thickening of the skull as the cause of the changes which he observed in the brain. Dr. Baillie, in his Morbid Anatomy, does the same. Often, however, the disease begins in the brain, and is propagated to the skull. Still, I do not deny that the skull may be diseased, and exercise a morbid influence upon the brain. I have, indeed, stated this in speaking of the pretendedly ossified brains.

It would be very interesting to note those madmen whose skulls are dense, and those whose skulls are not so, or whose skulls are dense and thick, &c. It would seem that the inflammatory state of the blood-vessels of the dura mater contributes to the density of the skull. Does the greater afflux of blood towards the skull augment the ossification? In idiots from birth, who live long, the skull is often thicker, but less dense than in furious madmen. A child of nine years of age felt a permanent headach: he became indifferent to his lessons, then stupid, and, after a few years, he was affected with convulsions: he died at thirteen years of age; and his brain was found to be covered with a false membraneous mass, which indicated a chronic inflammation of the arachnoid coat; the skull was very dense; and the frontal bone was at the same time thick. It is a well known fact, that at the union of fractured bones, the ossification is more solid than at other parts. We have also seen several skulls which, being injured, had suffered from inflam-

mation, and which were thicker or at least denser and heavier than natural. Gall preserves in his collection the skull of a soldier who, at the battle of Ozakow, had received some severe blows with the but end of a gun: he became mad in consequence of them, and lived in that state during thirty years: his skull is like ivory. A stone fell upon the head of a person, and deranged his mind; the person died a long time after; and his skull is dense and heavy.

This observation, relative to the density and thickness of the skulls of madmen, is disputed. We, however, support our assertion by experience. I find also similar skulls in various cabinets, but it is seldom that the proprietors are acquainted with the history of those to whom these skulls belonged. Mr. Richard Smith, of Bristol, possesses an excellent specimen of this kind. Some places of the upper part of the skull are two thirds of an inch in thickness. There, however, were anatomists and natural philosophers who, before us, made the same observation. Greding, at Waldheim in Saxony, has opened several hundreds of skulls of madmen, and he found that the greater number of their skulls was thick and dense. We have ourselves opened a great number, and among them many who died at the Salpetrière and in the Bicêtre: we found their skulls dense and often thick. Dr. Goergen, at Vienna, has also in his collection many skulls of this kind. Thus it is indubitable that the skulls of many mad persons are dense and thick.

We have also observed that the skulls of indivi-

duals, who for a long time had a propensity to suicide, are commonly dense and sometimes thick. Here, however, it is necessary to distinguish those who kill themselves in a fit of momentary despair, or from a short melancholy, or from this disease in particular; for it is impossible that the state of the ossification should be changed in a few days. These researches relative to the skulls of alienated persons, though important in physiology and pathology in general, and immediately connected with organology, are not essential to it in as far as we intend to determine the functions of the brain. We even admit that, in those individuals who are long diseased, it is impossible accurately to measure the size of the brain according to the size and shape of the head.

RECAPITULATION.

It results from that which I have said, in respect to the methods of determining the functions of the brain, that it is impossible to succeed in an examination of the absolute size of the brain, or its size in proportion to that of the body; or by means of the facial angle of Camper; or in comparing one cerebral part with another; or by the aid of anatomy; or by that of mutilations; but that it is possible to point out the nature of the functions of every cerebral part, by comparing the energy of the functions with the size of the respective organization. As to the possibility of distinguishing the size of the brain in general, and of its parts in particular, according to the size of the head,

I have shown that it is indifferent what cause determines the form and size of the head; but that it is sufficient that we actually distinguish the size of the brain: I have considered various opinions about the cause which produces the form of the head: I have indicated the ages wherein it is possible, in living persons, to determine the size of the brain: I have examined the difficulties we meet with, and have explained how they may be removed: I have finally spoken of those cases wherein it is impossible to determine the size of the brain, or wherein our judgment is at least very uncertain. If then these researches be made in conformity with such considerations, it is obvious that they deserve some study, and those who endeavour to follow them will be convinced that some difficulty does not exclude the possibility of success.

PART III.

PHYSIOGNOMICAL KNOWLEDGE OF THE HUMAN MIND.

WHAT can be more interesting to man than the knowledge of the human mind, and the doctrine which teaches him to distinguish the feelings and thoughts of other men. Physiognomy is, indeed, the most attractive of all studies. Hence it has been cultivated, and various opinions in it maintained, even from the highest antiquity. Yet all philosophers and physiologists agree as to our ignorance of psychology. In the introduction to this work, I have mentioned various causes of this, and I have considered as the principal, the blameable method of studying man. According then to the principle established by Lord Bacon, " that nothing new can be done, except in a new manner," we shall adopt a process different from that of our predecessors.

Man is a being of creation; and therefore the study of his nature requires the same method as the examination of every other natural being. Now every class of living beings presents two parts for investigation; the bodily structure, which is the object of anatomy, and the functions, which are the objects of physiology. Thus it is necessary to study in man—1st, The structure of the whole body, and that of each part in particular. 2d, The functions in general, and those of every part in par-

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ticular. 3d, The mutual influence of the different parts, and of their functions; and 4th, The relations between man and all the beings around him, whether inanimate or animate, even the relation to his Creator. The knowledge of mankind may farther be divided into the knowledge of the healthy, and into that of the diseased state. Before, however, I speak of the method, let us determine the object of our investigations.

At all times philosophical inquirers have divided beings into creative and created; and these last were subdivided into spirit or soul, and matter. The word spirit was given to every being which did not fall immediately under the senses; namely, which was not palpable, tangible, measurable, or visible. Every thing, on the contrary, which possessed these qualities, was called matter. Thus this division into spirit and matter was founded on the density of beings. Several beings therefore, which formerly passed for spirit, must actually be considered as matter.

According to this definition of spirit, it is evident that we never can have the least knowledge of its nature; and we are therefore obliged to content ourselves with that of material beings. We are acquainted with the existence of spirits, only so far as their phenomena or manifestations fall under our senses.

Material beings offer to our consideration matter and phenomena. Now it is not easier to acquire any knowledge of the nature of matter than of spirit. Thus we can inquire only into phenomena. In

ancient times, all phenomena were considered as effects of the operation of spirits or souls; and all the motions of stars, all the functions of plants and animals, were thought to be produced by them: hence their multitude, according to Thales, Pythagoras and others. Matter, according to this system, was inert.

The philosophers who treat of spirits form two classes: those who consider them as material, as Zeno and the Stoics; and those who admit an immaterial principle. These latter admit in man either several principles, or one single soul; yet it is to be observed, that in man no more than one principle was even by them considered as immaterial. Pythagoras, Alcmeon, Plato and others speak of one rational soul, and of one irrational soul, in man. Aristotle, Galen and their disciples, as far down as the seventeenth century, attributed to the soul all the operations of life. Thomas Aquinas ascribed to it an unbounded power over the body. Borelli, Robinson, Cheyne, Mead, Porterfield and others, considered the soul as the efficient cause of the organization. Swammerdam, Perrault and Stahl, honoured it as the guardian of health, or the cause of disease.

On the other hand, it is also an ancient doctrine, that every atom is endowed with a primitive property. Philo the Jew taught this doctrine; and accordingly several philosophers considered all phenomena as produced by the form and combination of the bodily organization. This opinion was openly maintained by Democritus, Heraclides, Epicurus, Asclepiades, Hippocrates, Erasistratus

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and others. The expressions of Thales, Pythagoras, Empedocles and Heraclitus, are not distinct and determinate enough to enable us to decide whether they believed in an immaterial soul or not.

The doctrine, that every thing is provided with its own properties, was from time to time checked by metaphysicians and scholastic divines; but by degrees it gained ground, and the maxim that matter is inert, was entirely refuted. Natural philosophers discovered corporeal properties, the laws of attraction and repulsion, of chemical affinity, of fermentation, and even of organization. They considered the phenomena of vegetation as the result of material qualities—as properties of matter. Glisson attributed to matter a particular activity, and to the animal fibre a specific irritability. In vegetable life also De Gorter acknowledged something more than pure mechanism. Winter and Lups proved that the phenomena of vegetable life ought to be ascribed to irritability alone. Of this, several phenomena of flowers and leaves indicate a great degree: the hop and French bean twine round rods which are planted near them; the tendrils of vines curl round poles or the branches of neighbouring trees; the ivy climbs the oak, and adheres to its sides, &c.

It would therefore be absurd to pretend that the organization of animals is entirely destitute of properties; and hence Friederick Hoffmann took it for the basis of his system, that the human body, like all other bodies, is endowed with material properties. Whytt, Sauvage, Hartley, Unzer, Charles Bonnet and others, maintained that all automatic

functions are produced without consciousness, and that in this sense the seat or residence of the soul is extended over the whole body. The writings of Isenflamm, Cullen, Musgrave, De la Roche, Thaer, Schaeffer and many others, present similar considerations.

It follows that the functions of man must be divided into two classes: into those which are produced by means of the organization alone without consciousness—*automatic life;* and those which take place with consciousness, and are the effect of the soul, but which are manifested by the organization—*animal life.* Hence, the object of our investigations is only these manifestations of the human mind, and the conditions under which they take place.

We never venture beyond experience. We neither deny nor affirm any thing which cannot be verified by experiment. We neither make researches upon the dead body nor upon the soul alone, but upon man as he appears in life. We consider the faculties of the mind only so far as they become apparent to us by the organization. We never question what the moral and intellectual faculties may be in themselves. We do not attempt to explain how the body and soul are joined together and exercise a mutual influence. We do not examine what the soul can do without the body. Souls, so far as we know, may be united to bodies at the moment of conception or afterwards; they may be different in all individuals, or of the same kind in every one; they may be emanations from God, or something essentially different. Hence, whatever

metaphysicians and theologians may decide in respect to all these points, our assertion concerning the manifestations of the mind, in this life, cannot be shaken.

In physiognomical study, the first thing to be considered, is the difference between physiognomy properly so called and pathognomy. The former is the doctrine which judges of the faculties of the mind according to the configuration of the solid parts of the body; the latter considers the motions of the mobile parts. In other terms, referring to their usefulness and application; the former considers the signs by means of which we can distinguish the dispositions of the mind; and the latter examines the signs which indicate the activity of the faculties. Thus, physiognomical knowledge may be divided into two parts: into physiognomy properly so called, and into pathognomy.

CHAPTER I.

METHOD OF STUDYING PHYSIOGNOMY, OR, RATHER, THE FACULTIES OF THE HUMAN MIND.

IN this study, as in every other, our leading principles are observation and induction. We, therefore, begin by observing what man is, and not what, according to the prejudiced opinions of some philosophers, he ought to be. The first thing then to be observed and generally known is, that the manifestations of the mind are different in both sexes, in each individual, and in the same individual at different ages. Some faculties are more energetic in men, others in women. In all nations, notwithstanding the uniformity of opinions, customs, professions and arts, sciences, laws, religion, and whatever relates to positive institution, each individual differs from another by his peculiar character. Each has more capacity and a stronger propensity for one pursuit than for another. Even every child manifests his own manner of thinking and feeling. It is a circumstance generally known, that every one excuses his frailties by saying, It is my nature; It is stronger than I am; I cannot help it, &c. Brothers and sisters often differ extremely from each other, though their education is uniform; and the man of greatest genius in one respect is often very weak in others. William Crotch, at six years of age, astonished all

his auditors by his musical talent; but in every other respect was a child: Cæsar never could have become a Horace or a Virgil; nor could Alexander have become a Homer. Sir Isaac Newton could not have been changed into as great a poet as he was an astronomer; nor Milton, into as great an astronomer as he was a poet. Michael Angelo could not have composed the paintings of Raphael, nor Albano those of Titian &c. In the same individual, moreover, the manifestations of the faculties are not simultaneous. Several faculties manifest themselves from infancy, others make a later appearance: so also several faculties disappear early, and others last till the termination of life. Now either minds are different in both sexes and in different individuals, and the mind of each individual changes at different periods of life, or there are other causes which account for these modifications.

It is often said, that the whole body determines the manifestations of the various feelings and intellectual faculties; and Lavater particularly insists on this harmony of the different parts of the body. According to him the form of every part, separated from the rest, indicates the form of all other parts, and even of the whole body. "All that belongs to man arises from the same source. All is homogeneous: size, shape, stature, colour, hair, skin, veins, bones, nerves, voice, manners, passions, love, hatred. He is always one." *

Our observations do not agree with this proposi-

* Tom. ii. fragm. 14.

tion. There is no harmony or proportion between the different parts; but it is, on the contrary, necessary to compare the relation of every faculty with its respective organ. Hence the physiognomical system of Lavater cannot be confounded with our doctrine. We maintain that the functions of each part depend on the healthy state of its organization; that there is no proportion between the different parts; and that it is only in so far as the organization of each part depends on others, that these mediately contribute to the possibility of the functions of every part. The function of seeing, for instance, depends mediately on the stomach, heart, lungs &c. because the organization of the eyes depends on digestion, circulation, and respiration; yet it is nevertheless certain that every well organized part performs independently its proper function. The many exceptions with which Lavater acknowledges himself to have met are evident proofs, that there is no permanent harmony between the different parts of the body.

Moreover, the manifestations of the mind do not depend on the size and shape of the whole body, either in respect to different species of animals, or in respect to different individuals of the same species. Otherwise whales, elephants, rhinoceroses, horses &c. ought, from their size, to have more understanding than man, and an ox or horse more than an oran-outang &c. It is certainly impossible to measure the faculties of the mind and understanding in men according to their size and shape; and in general little persons have more understanding than tall

ones. In one word daily observation is in opposition to the opinion that the manifestations of the feelings and intellectual faculties depend on the shape and size of the body.

Both among ancient and modern authors, the opinion is more common that the faculties of the mind depend on the organic constitution of the whole body, that is, on the temperaments. It is, however, very easy to refute this error.—What are the temperaments of men from which their faculties may be derived? Why are all animals neglected in this doctrine of temperaments? How can all their faculties be explained by the small number of temperaments and their combinations? Idiots having certainly something of temperament, why do not they exert proportionate faculties? It is conceivable how a different organic constitution may produce a different degree of activity of the faculties in general; but it is inconceivable how the same temperament can give great energy and strong passions with regard to some things, while the manifestations of other faculties are very weak. It is certainly obvious that there is no proportion between the vital functions and the faculties of the mind. A man may be well nourished and active, and yet at the same time either stupid or intelligent. Neither is there any fixed and constant proportion between temperaments and the determinate faculties of the mind and understanding. Many persons who have a melancholy look are not at all melancholy; we find sanguine and bilious individuals, who are intellectual or stupid, meek or impetuous; and we may

observe phlegmatics of a bold, quarrelsome and imperious character. In short, the doctrine of the temperaments, as applied to the indication of determinate faculties, is not more sure, nor better founded, than is divination by the hands, feet, skin, hair, ears and similar physiognomical signs. I shall afterwards enter into these considerations. In many diseases, moreover, the humours and organic constitution of the body are much altered, yet the faculties of the mind and understanding do not suffer a proportionate alteration.

We do not deny the influence of the organic constitution on the manifestations of the moral feelings and intellectual faculties; but the derivation of determinate faculties and positive propensities from the temperaments is quite different from the assertion, that the manifestations of the faculties of the mind are modified by the organic constitution of the body in general, and of the respective organs in particular. There are beyond doubt some individuals more irritable, more energetic, and more fit to be exercised than others; but the organic constitution of the whole body does not constitute the condition by which the manifestations of the moral sentiments and intellectual faculties are rendered possible.

Malebranche* deduced the different modes of thinking and feeling in men and women, from the different degrees of the delicacy of the cerebral fibres. This, however, is a supposition rather than

* Tom. i. 5me Edit. p. 155.

a fact founded on observation. I have also shown, that it is impossible to measure the faculties of the mind according to the absolute size of the brain; or according to the proportionate size of the brain to the face;—or by the facial angle of Camper;—or by comparing one cerebral part with another. Let us, therefore, now detail our mode of proceeding.

Dr. Gall, from his earliest youth, was attentive to the difference which existed between his brothers and sisters, and his school-fellows. He was particularly vexed, that while several of his school-fellows learned by heart even things which they did not understand, with great facility, he had the utmost difficulty in engraving in his memory a smaller number of words. On the other hand, however, he found that he excelled them in the powers of reflection and reasoning. He afterwards observed, that in those individuals who had so great a verbal memory, the eyes were very prominent; and this observation was the commencement of all his future inquiries into psychology. Studying medicine, he learned that the functions of the brain were not known; but, at the same time observing that prominent eyes indicate a good verbal memory, he thought that other internal faculties might perhaps be distinguished by the external form of the head.

Gall, for a long time, participated in all the errors of philosophy, and he did not leave this false mode of reasoning, till he had perceived that all his researches were useless. At first, he had compared the size and form of the whole head only with the general faculties of the understanding: he

looked for particular signs only of memory, judgment and imagination; and he did not think that the feelings also reside in the brain. Accordingly not at all succeeding by this method, he abandoned all the notions of philosophy, and compared the form and size of the whole head with the favourite occupations of each individual. It is generally known that certain persons are naturally endowed with particular faculties. Some are from birth fit for mechanics, or for music, for painting &c. Gall accordingly compared individuals who excelled in any one kind of functions, and examined the whole form of their heads; he consequently for some time believed that great mechanicians may be distinguished by a face enclosed between two parallel lines, that is, equally wide at the forehead and at the jaw-bones; and that the forehead of great musicians is triangular. He met, however, with exceptions; and was consequently aware that he had not yet found the truth; for nature makes no exceptions in her laws. If the eye be the organ of sight, vision can never exist without the eye; and it is the same with the internal organs. If any faculty be attached to a particular organ, this organ can never be wanting if the faculty manifest itself. This truth is indeed as evident as that which states that no effect can take place without a cause. Gall was therefore obliged to give up his former method of investigating the general configuration of the head, to which he had devoted himself during several years. He has remarked, however, that this kind of observation was not entirely useless to him,

because he acquired from it a habit of distinguishing the slightest differences of configuration.

Bearing then in mind his first observations, in which he distinguished a good memory by the developement of a particular part of the brain, *viz.* by prominent eyes, Gall sought to discover particular organs only by comparing them with the natural vocations of different persons: that is, when, for instance, he observed any mechanician, musician, sculptor, draughtsman or mathematician, endowed with his peculiar faculty from birth, he examined their heads in order to discover a corresponding developement of some cerebral part. In this way, he, in a short time, discovered, in musicians and mechanics, the developement of particular parts. He indeed observed that the respective organ is always highly developed, when the same great talents are innate, while the rest of the head presents very different shapes in different individuals. At first he confined his observations to men of partial genius; and such individuals were indeed most proper, not only because their organs are easily pointed out, but also because these persons alone resist the influence of external circumstances and of education. These individuals are also the most proper for establishing the organs and giving conviction to beginners; for in them, the organs are most easily distinguished, and the relation between the developement of the cerebral parts and the particular manifestations of the mind is most evident. It is also important to observe the characters of persons who, being uncultivated persons, are consequently

least capable of dissimulation. Being physician to the Establishment for the Deaf and Dumb at Vienna, Gall was for this purpose fortunately circumstanced; he could observe the natural state of their manifestations, and their different degrees of susceptibility of education. With this view, he also called into his house common persons from the lower classes, and excited them to such conversation and behaviour as might make him acquainted with their characters.

Gall then investigated particular organs according to the principal actions of men, and he named the organs according to these actions. He observed, for instance, individuals who were born mathematicians, mechanicians, musicians, philologists, metaphysicians, poets &c., and if he found a certain part of their brain uniformly more developed than the rest, he termed these cerebral parts, the organs of mathematics, music, philology, metaphysics, poetry &c. In the same way did he observe individuals who from birth were stubborn, proud, courageous, thieves, murderers, religious &c., and if he found the size of some cerebral part correspond to the degree of these actions, he called these parts of the brain, the organs of firmness, pride, courage, theft, murder, religion &c. Being unacquainted with the special faculties, Gall could proceed in no other way; and he erred only in not suspending the denominations of the organs. He was obliged to observe man only in action; but as the actions of man and animals are seldom the result of one single faculty, and as many actions result from an abuse

of the faculties, it may easily be conceived that the nomenclature established by Gall was very defective. It is true that in individuals who, for instance, have stolen from infancy, notwithstanding the most careful education, and the severest punishment, one part of the brain is particularly developed; but all persons in whom this organ is much developed are not therefore thieves. It is the same with the organ of murder: those who from infancy have a propensity to murder present one part of the brain highly developed, but all persons who have this organ thus developed have not therefore murdered.

It is indeed evident that no organ should be named according to the abuse of its faculty. Greediness and drunkenness depend on a certain organization, but it is not therefore said that there are organs of drunkenness and greediness. The abuses of physical love also depend on a certain organization, yet no one speaks of an organ of the abuses of this faculty. I shall afterwards show that such also is the case as to organs of theft and murder. These functions are abuses which result from the highest degree of activity of certain organs, when not directed by other faculties. Hence Gall, who distinguished the organs only when they were extremely developed, while the other organs were very small, observed a certain organization in inveterate thieves. This will indeed always be the case, and Gall, as mentioned above, was wrong only in naming this organ according to its abuse. Moreover Gall, in his mode of proceeding, has observed only the particular actions which accompany the different

organs, but has not determined their special faculties. Hence his complaint in respect to every organ, that he does not know its sphere of activity. His mode of observation, however, was necessary, and has prepared the way for several philosophical considerations, which elucidate this doctrine and render it conformable to all other physical and moral truths.

Let me now state the means which are fit for determining the organs of the manifestations of the mind. Gall compared all energetic actions with the greatest developement of any part of the brain; and when he found that a greater developement of any cerebral part corresponded with any given energetic action, he supposed that this part of the brain might be the related organ. The probability then increased in the same proportion as the number of observations was multiplied. Moreover, if the head of any individual presented any protuberance, which was evidently the result of cerebral developement, Gall endeavoured to be acquainted with the talents or the dominant character of the person. If it were an organ which he had previously determined according to the actions of others, and if the actions or inclinations of this person were still concordant, the probability increased. If it was a new organ, he compared in other individuals similar actions or inclinations with the developement of the respective part of the brain; and concluded accordingly. In these two ways did he determine all the organs he discovered: thus he pointed out those which he called the organs of propagation, murder,

theft, mechanical arts, music, mathematics, and metaphysics, by determining the organs according to the energy of the actions; and he discovered the organs of philoprogeny, circumspection and religion, by determining the actions according to the protuberances.

Now, if energetic actions are at once produced and indicated by large organs, it unavoidably follows that weak actions are at once produced and indicated by small organs. On this account, Gall compared the weak functions of individuals who were almost destitute of particular faculties with the respective organs, and weak organs with the respective actions; and if weak actions were found to correspond to small organs, or small organs to weak actions, these proofs in a negative way confirmed the first conclusion. Many circumstances have contributed to multiply these positive and negative proofs. For this purpose, it is necessary to live in large towns, and to frequent every class of society. Gall accordingly was professionally acquainted with many families; and being physician to the director of the schools at Vienna, he had an opportunity of examining every child who excelled; while, having himself no children, he was not obliged to spare expense for their sake. He was also bold enough to address every person in whose head he observed any distinct protuberance. In our travels, therefore, we have been able to obtain much information; to observe many distinguished persons, and to compare their organization with their faculties; in one word, to collect innumerable facts by our visits to

establishments for education, to hospitals for idiots and madmen, to houses of correction and to prisons, and by our intercourse with different nations and with all classes of society.

It is known that, in general, physical truths improve in proportion as observations are repeated. We continue therefore to multiply our observations; and as in respect to several organs the number of these observations is immense, we consider the respective organs as established. With regard to them we must therefore insist on our opinion, so long as from experience we are not convinced of the contrary. Several organs however are still only probable, and others merely conjectural, requiring a greater number of observations in order to be determined with the same degree of certitude as those which are supported by the most satisfactory proofs. It is however objected that the organs cannot be verified, because our conclusions are drawn only from individual facts. But is not this the case with every physical truth? No physician has observed every fact; no anatomist has seen the viscera of every one. Yet in consequence of the stability of natural laws, physical truths are admitted, and the position and structure of the viscera are supposed to be the same in individuals who have not been opened as in those who have. It has also been objected that our observations may be true only in one country; and that it is necessary to repeat them elsewhere. Our travels have refuted this objection, because we have every where had opportunities enough of multiplying and confirming the same observations.

Gall soon felt the necessity of making a collection of casts of individuals remarkable for any quality, whether talent or moral sentiment. Having, therefore depressed and flattened the hair, he modelled them in plaster, and imitated as exactly as possible the whole configuration of their heads. By these means he was enabled to multiply and to rectify his observations; he could compare at the same time different individuals endowed with similar faculties; and he could examine them at leisure, which was a very important circumstance; for our mind does not act always with the same energy and acuteness. Gall allows that he often placed together the busts of individuals who excelled in the same functions without distinguishing any difference in the shape of their heads; sometimes he looked in vain at them for several weeks; and sometimes he was able to point out an organ without previously thinking of it. Those who have not engaged in similar studies may have some difficulty in conceiving this assertion; but those who have made similar observations know how long it is necessary to exercise the eyes in order to perceive every difference of form and size. The collection of busts procured still another advantage. Many of these individuals were remarkable in several points of view, whether in an affirmative or negative manner; and they therefore presented various points of comparison. Gall at the same time made a collection of skulls, especially of those persons who were remarkable for any particular quality, and if possible of those whose busts he had modelled in plaster. In this manner, he learned to

compare heads with skulls; and, moreover, could verify the forms of the organs.

As the arrangement and position of all parts which are common to man and animals are the same, it is very useful to compare with each other animals which are endowed with the same faculties, and also to compare them with animals which are destitute of these faculties. In this way the points of comparison become extremely numerous, and our observations, in respect to faculties common to man and animals, may be repeated to infinity. No organ, however, has been discovered in animals; but all were pointed out in man; and the reason of this is, that, in order to attain certainty, our observations must be confined to individuals of the same kind, and chiefly to individuals of great talent. Some discoveries as to the physiology of the brain, made on animals by agriculturists, countrymen, hunters, and jockeys, have been found in different individuals of the same kind. Peasants, for instance, know that horses with a large forehead are more docile than those with small foreheads; and therefore they put them at the head of the team. Some jockeys distinguish biting and stubborn horses by the configuration of the forehead. Now these persons made such observations as to the different forms of the head without knowing their basis, which really depends on the greater or smaller developement of the cerebral parts. Thus, the comparative anatomy and physiology of the brain may contribute greatly to determine the organs. Many animals, I may observe, are mutilated by nature, and it is not

necessary to make them undergo violence in order to determine their functions. In fine, comparative anatomy shows that in lower animals the brain is more simple, and in perfect animals more complex; and, accordingly, it is observed that the faculties multiply in proportion as the parts of the brain are more numerous.

The anatomy of the brain in particular aids us in establishing the organs. First, the bundles which constitute the organs are distinct, and no central point is perceived. The plurality of the organs therefore is as evident as the plurality of the faculties. Moreover, some faculties have a great sphere of activity, while the actions of others are very weak; and it is observed that the size of the respective organs is in direct proportion to these circumstances. It is known, for instance, that the moral sentiments act with greater energy than the intellectual faculties; and anatomy exhibits to us a corresponding difference in the natural size of the respective organs. Anatomy shows also that the various cerebral parts are not simultaneously developed, in the same way as the manifestations of the mind are not, at the same period, called into action. In short, anatomy always corresponds to physiology, and *vice versâ*.

The diseased state of the brain and its accidental injuries may also be taken advantage of, in order to determine particular organs; but I have already observed that these kinds of observation are very uncertain. They are only secondary, and by no means decisive; yet are they interesting, when

combined with other direct and evident proofs. In treating, therefore, of the particular organs I shall make such observations, without, however, maintaining that it is possible to point out the organs solely by them. Mental alienations, and chiefly partial insanities, monomania, and the state of idiotism, are much more conducive to our object than accidental injuries of the brain. In idiots from birth, the whole brain is small or distended by water. In madmen with partial insanities, the respective organs are commonly more developed than the rest, and their external signs are easily perceived; for it may easily be conceived that persons who manifest a certain sentiment or intellectual faculty, with peculiar energy, show, in a state of great irritation, this faculty in the highest degree. I never saw a fool from pride without a great developement of the organ of self-love. It seems to me, however, that very great developement is not indispensably necessary to every partial insanity, for every part of our body in general, and of our brain in particular, may grow more irritable than the rest, and therefore the energy of every cerebral organ may also increase and produce partial insanity.

It is of great importance to consider the heads of different nations. Several anatomists and physiologists have accordingly endeavoured to point out the particular shape of their heads; and though all the observations of this kind which have been made are very defective, they are yet rather in favour of, than in opposition to, the physiology of the brain. The foreheads of negroes, for instance, are very

narrow, and their talents of music and mathematics are also in general very limited. The Chinese, who are fond of colours, have the arch of the eye-brows much vaulted, and we shall see that this is the sign of a greater developement of the organ of colour. According to Blumenbach, the heads of the Calmucs are depressed from above, but very large laterally about the organ which gives the disposition to covet, and it is accordingly admitted that this nation is inclined to steal &c. In the same way, the manner of thinking and feeling of different nations may be compared with those of their organs which are most developed. It is obvious that I here speak only of the greater number of individuals in every nation; and only of the general type of their heads; for the modifications are in all countries infinite. Generally speaking, however, there are nations whose heads are longer or shorter, higher or lower, narrower or broader &c.

There is still another means of pointing out or of confirming the organs, namely, mimickry. Every internal sentiment is manifested outwardly by certain motions of the head, body and hands; and these external manifestations are the constant and inevitable result of the internal faculties. They are also essentially the same in all nations and at all times. I do not at present intend to detail the principles of the doctrine which explains the external manifestations: this consideration belongs to the practical part of anthropology; and I shall therefore treat of it afterwards. I shall here mention only one principle relative to the seat of the organs; namely, that the motions are conformable to the

seat of the organs. If, for instance, a faculty, the organ of which is situated in the posterior part of the brain, be active, the general motions are backward; and if its organ be in the forehead, then the motions are forward.

By all these means, which we continually employ in order to multiply our observations, every organ may be determined, and those which are merely indicated may be confirmed. The number of facts we have thus collected is immense, but it is impossible to quote the whole of them: I can speak only of their results, or the general inductions from them. Moreover, no one can attain personal or individual conviction before he has made the same observations. Gall admonishes his auditors not to practise this doctrine because it is so difficult: I, on the contrary, invite every inquirer to repeat these observations in order to obtain self-conviction. Hence also every inquirer ought to consider it his duty to be well acquainted with this doctrine, before he endeavours to make any application of it. It is true that it requires examination, and I can show only what is to be observed and how it is to be done; but I shall never advance any thing that cannot be observed by every other person. I do not, however, listen to any objection grounded upon reasoning alone, and destitute of all observation; one fact well observed is to me more decisive than a thousand metaphysical opinions. I, with Mr. Abernethy,* think that "when books of this kind are published, mutual forbearance is requisite on the

* Surgical Observations on Local Diseases. London, 1809. Pref. p. vii.

part both of the writer and the reader. The former should not expect his work to be approved of, till the latter has examined whether his representation be correct, and his conclusions legitimately drawn from the facts which he has observed and collected. Neither should the reader condemn the work till he has examined the subject, and is in consequence able to point out the errors of the premises or conclusions. The author's view of a subject may indeed be correctly formed from the facts which he himself has witnessed, but it may differ from that which more extensive experience would have suggested. For this difference no blame can properly be attached to him; he relates what has fallen under his own observation, and invites others to attend to the same facts." We accordingly flatter ourselves that every one who, without any prejudice, may take the trouble to examine and repeat our observations will be convinced of the solidity of these principles of the physiology of the brain.

CHAPTER II.

ON PHYSIOGNOMY, OR ON THE INTERNAL ORGANS OF THE MANIFESTATIONS OF THE MIND.

BEFORE I examine the internal organs of the mind, or the signs by which it is possible to distinguish its various dispositions, I may repeat, that we consider the size of the organs as a means sufficient to determine the nature of the functions of the cerebral parts, but that the different degrees of the activity of the faculties depend not only on the size of the respective organs, but also on their organic constitution, on the exercise of the faculties, and on their mutual influence.

Moreover I must request the reader to observe, that this chapter, though entitled Physiognomy, constitutes also the Physiology of the Brain, and that it is only as to its application that it may be termed Physiognomy. Before I enter into its details, I shall likewise answer a question which may be put with respect to every organ, *viz.*, *Why do you admit a particular organ of this, and not of another function?* In speaking of actions alone, it is certainly difficult to conceive the necessity of particular organs; yet the answer is decisive if we can say, Experience demonstrates it. As moreover I look for special faculties, and not merely for their organs and signs, the necessity of every organ may be demonstrated even by reasoning, that is, by the proofs

which demonstrate the plurality of the organs. Consider these proofs in respect to every organ, and it is impossible to be mistaken. Hence it is necessary to point out a particular organ for every faculty,

1. Which exists in one kind of animals and not in another:

2. Which varies in both sexes of the same species:

3. Which is not proportionate to the other faculties of the same individual:

4. Which does not manifest itself simultaneously with the other faculties, that is, which appears or disappears earlier or later than the other faculties:

5. Which may act or rest alone:

6. Which alone is propagated in a distinct manner from parents to children: and

7. Which alone may preserve its proper state of health or disease.

Gall did not determine any organ in conformity with these views. He followed only the empirical method, that is, he looked for organs according to the active functions of man. I have mentioned, however, that the actions do not always indicate the special faculty; and that there are very few actions which result from one of these faculties. Nevertheless, the proceeding of Gall is conducive to the determination of the special faculties, and of their sphere of activity. I shall not then treat of the organs in the order in which they have been discovered, but according to their situation in the brain, beginning with that which is lowest in situation.

I shall first, however, consider, whether the faculties which manifest themselves by the cerebral parts may be divided or not. Before the time of Gall, all physiologists and philosophers sought for the organs only of the understanding in the brain, and for those of the moral sentiments elsewhere: Gall was the first who showed that the organs of the feelings are also situated in the brain. Moreover, opinions in respect to the faculties of the mind have hitherto been extremely vague. Even at the present day, the most common division of these faculties is into will and understanding: *will* is subdivided into various modifications, as inclination, propensity, desire, and passion; and *understanding* into perception, memory, judgment and imagination. All the functions of animals have also been considered as the effect of *instinct*. Now all these expressions are general or common, and these general and common faculties have no particular organs. It is also wrong to call the faculties of animals by the term *instinct* in opposition to the understanding of man; for many actions of animals are accompanied with understanding, while many actions of man are the result of mere instinct. Moreover the division of the human faculties into will and understanding is very inaccurate. I shall in another chapter elucidate these considerations; and shall then show that it is a great mistake to consider will as a generic expression of every propensity, inclination and desire. Here I maintain only that will, as a generic name, indicating every propensity, cannot be considered as a particular class of func-

tions different from the intellectual faculties; for every faculty, whether moral or intellectual, desires, or has some propensity, as soon as it is active. The faculties of space, colour, tune, comparison &c. being active, desire. Every faculty desires more or less, from the weakest propensity to the highest degree, called passion. Thus the division of the human faculties into understanding and will, in the ordinary sense, is incorrect. Gall therefore rejects all divisions of the faculties which are manifested by the brain: he admits in every organ all modes of action. It seems, however, to me that different divisions of the cerebral faculties may be admitted. It is indeed true that all faculties desire, but all faculties do not present those modifications of action of which the intellectual faculties are capable. The moral sentiments have neither memory, nor judgment; they produce only feelings; while the intellectual faculties have not only propensity, but also peculiar modifications of action of which the other faculties are destitute. Moreover, it seems to me that there is some difference between the different feelings. Several of them produce a mere propensity, while others produce some sentiment which is not only propensity, but a particular mode of feeling which must be felt in order to be known; as self-love, justice, compassion &c. All the faculties which I call propensities are common to man and animals; but the faculties which produce propensity, together with a peculiar feeling, and which I call sentiments, may be subdivided into those which are common to man and

animals, and those which are proper to man. Certain other faculties are destined to make us acquainted with the external world, and the qualities of external bodies; and these I term knowing faculties. Still other faculties compare the relations between the different external bodies, the relations between external bodies and the internal faculties, and those between the internal faculties themselves; and these I term reflecting faculties.

Thus I divide and subdivide the class of mental faculties, according to the common practice of natural history, into orders, genera, species and varieties. The expression *Mind* designates the class of faculties. I divide it into two orders: feelings (*Gemueth*, in German) and intellect. The feelings are subdivided into two genera: propensities and sentiments. The propensities begin with those of eating and drinking; and many instincts of animals belong to this genus, while others, as those of singing and migrating, belong to the knowing faculties. The second genus of feelings consists in sentiments, some of which are common to man and animals, and others proper to man. The second order consisting of mental faculties, the intellect, is subdivided also into two genera: knowing, and reflecting faculties. Moreover, there are different species of propensities, of sentiments, of knowing, and of reflecting faculties. There are varieties of the different species; and we observe even monstrosities in the manifestations of the peculiar faculties.

ORDER I.—Feelings.

Genus I.—*Propensities.*

I. ORGAN OF AMATIVENESS,* *(physical love.)*

Dr. Gall did not originally think that there was an organ of this propensity in the brain; but discovered its existence by chance. Being physician to a widow who was subject to very strong hysterical fits, during which she drew her head backward with great violence, Gall sometimes supported her head with his hand, and, in doing so, observed that her neck was very large and hot. He was acquainted with her character as well as with this fact, and he accordingly considered in connexion her passion, this magnitude of the neck, and the consequent developement of the cerebellum: he was naturally led to inquire, whether there might not be some relation between the magnitude of the cerebellum and this particular propensity. Indeed it is impossible to unite a greater number of proofs to demonstrate any natural truth, than may be presented to

* The reasons which have induced the author to make new names, and to choose the termination *iveness*, for his nomenclature of the propensities, are mentioned in the Preface, to which the reader is referred.

determine the function of this organ. First, none of the causes which are commonly admitted is sufficient to explain the existence of this propensity.* Moreover, organized beings which are propagated by buds, by slips, or by cuts, have neither brain nor cerebellum; while those animals which present a nervous mass corresponding to the cerebellum generate by a union of the sexes. This observation alone, if it could be verified in all natural beings, would be sufficient to prove the existence of this organ. This, however, is impossible, as some animals are too small to admit of any demonstration of this kind from dissection.

In new-born children, the cerebellum is to the brain as one to nine, ten, thirteen, twenty or more; and in adults as one to five, six, or seven. Professor Ackermann maintains that the cerebellum is perfectly developed at the end of two years; but we have compared the heads and skulls of children from two till sixteen years of age, and we have

* Partes genitales sive testes hominibus, et fœminis uterus, propensionem ad venerem excitare nequeunt. Nam in pueris veneris stimulus seminis secretioni sæpe antecedit. Plures eunuchi, quanquam testibus privati, hanc inclinationem conservant. Sunt etiam fœminæ quæ, sine utero natæ, hunc stimulum manifestant. Hinc quidam ex doctrinæ nostræ inimicis, harum rerum minime inscii, seminis præsentiam in sanguine contendunt, et hanc causam sufficientem existimant. Attamen argumenta hujus generis vera physiologia longe absunt, et vix citatione digna videantur. Nonnulli etiam hujus inclinationis causam in liquore prostatico quærunt; sed in senibus aliquando fluidi prostatici secretio, sine ulla veneris inclinatione, copiosissima est.

always seen that at these ages the cerebellum is yet imperfectly developed. In proportion as the cerebellum is developed this propensity appears. It has, however, been said that the cerebellum is developed in proportion as this propensity is active; but other proofs show evidently that the developement of the cerebellum always precedes the manifestation of this faculty. In adult persons, the cerebellum being perfectly developed, this propensity exists in its greatest energy; and its activity is even proportionate to the particular developement of the cerebellum. It is known that men vary in respect to this propensity: in some individuals, it is almost wanting; in others it is moderate; in others again it is very violent. In the first the cerebellum is very small (*Pl.* VI. *fig.* 2. I.); in the second it is of a middling size; and in the third class it is very prominent.—(*Pl.* VI. *fig.* 1. I.)* It is indubitable,

* Plures viros, hacce appetentia abusos, eamque ob causam carceratos, vidimus, quibus, e magnitudine cerebelli, collum quam maximum fuit.—Equos, tauros arietesque quibus profusius collum, majore propagandi vi donatos esse, agricolæ et armentarii a longinquitate temporum animadverterunt. Notum est etiam columbas quæ in hac re aliis excellunt, a majore magnitudine colli distingui.

Virum et mares majorem quam fœminas, copulandi cupidinem sentire certum est. "In venere exercenda," ait Hippocrates de Geniturâ, "longe minorem quam vir voluptatem mulier percipit, vir vero etiam diuturniorem." Plurima apud animalia mos est unum marem pluribus cum fœminis vivere; sed in paucis speciebus una fœmina pluribus cum maribus conjuncta est. In multis speciebus, mares per totum annum veneris stimulum sentiunt, dum fœminæ certis solum anni temporibus a maribus suis amari volunt. Imo in animalibus matrimonio conjunctis, mares fœminis multo salaciores sunt.

that men and male animals (*Pl.* VIII. *fig.* 1 & 3. I.) in general, have a larger cerebellum than women (*Pl.* VII. *fig.* 1 & 2. I.) and females (*Pl.* VIII. *fig.*

In omni animalium specie, cerebelli configuratio ad veneris appetentiam referre videtur. Nam mares fœminis, et fœminæ maribus, ejusdem speciei imprimis, dediti sunt. Solummodo a nimia hujus organi activitate perturbatio oritur.

In erotomania cerebellum grande plerumque observatur. Asseri tamen non potest, omnibus erotomania laborantibus magnum esse cerebellum. Hoc organon enim, sicut omnia alia, sine ulla præcipua magnitudine, morbida activitate ægrotare potest.

Actio reciproca, quæ existit inter cerebellum et partes genitales, etiam cerebelli functiones probat. Sic castratio cerebelli incrementum imminuit, nam in hominibus atque animalibus castratis cerebellum crescere desinit. Quam ob rem eunuchis atque animalibus, in prima ætate castratis, est collum valde exiguum, et copulandi cupido nulla. Contra, homines cæteraque animalia, post plenos annos castrati, quanquam testium expertes, sensum tamen eroticum et copulandi stimulum conservant. Hinc testes cupidinem non producere patet.

Pubertatis tempore, mutua colli genitaliumque organorum actio est præcipue insignis. Tum crescit barba, tum crescit larynx, tum vox mutatur, itemque testes et alia organa genitalia officiis suis fungi incipiunt. Eodem tempore crescit cerebellum. Dum animalia catuliunt, eorum colla insolito cum tepore tumescunt, vox etiam raucissima evenit.

> Non illam nutrix orienti luce revisens
> Hesterno collum potuit circumdare filo.

Quæ facta veteribus plane nota fuere, sed causa usque ad nostram ætatem latuit. Castratio, eadem de causa, craniorum figuras necnon armentorum atque alium animalium cornua mutat. Bobus castratis longiora, quam tauris, sunt cornua. Cervorum testibus injurium passis, cornua male crescunt; cornubus defalcatis paulo ante rugitum, multo minus certa est eorum propagatio.

Cerebello vulnerato partes genitales in sympathiam trahuntur. Gall, Vindobonæ Austriacorum, duos milites, e vulnerato occipite, impotentes fieri observavit, quorum unus, duobus post annis, ve-

2 & 4. I.). It is not, however, a law, that the cerebella of males are uniformly larger than those of females: there are exceptions, and of these more

neris appetentiam et copulandi potestatem iterum recepit, puerosque genuit. Formey Berolinensis narravit nobus historiam cujusdam qui, occipite vulnerato, primum priapismo, dein impotentia, vexatus est. Veruntamen sex post mensibus virilitatem recuperavit. Larrey, Parisiis, plures milites, occipite vulneratos, quorum partes genitales decreverant, nobis monstravit. Unus, dum septendecem annos natus, occipite vulneratus est. Postea penis et testes magnitudine propria defecerunt; vox fœminea permansit, et barba per vitam fuit nulla. Veteres semen in cerebello secerni, ac per spinam descendere putabantur. Sic Hippocrates, De Geniturâ, iii. sub fine: "Quibuscunque juxta aures venæ sectæ sunt, hi coëunt quidem et genituram emittunt, verum modicam et debilem ac infœcundam. Nam plurima genituræ pars a capite juxta aures in spinalem medullam procedit." Alio loco: * "Atque mihi," inquit, "sane videntur ea medicatione seipsos perdere. Venæ enim retro aures sunt, quas siquis secet, sterilitatem inferat his quibus secantur; quare id etiam ipsis ex earum incisione accidere certum est. Quando igitur postea uxores adeunt, impotentesque se factos vident, cum illis coire primum quidem nihil molestius cogitantes quiescunt (Scythæ).

Apollonius Rhodius, de Medeæ amore erga Jasona loquens, illam ardore consumi, et capite usque ad infimum nervum dolore cruciari, asserit. Professor Rheinhold, Lipsiæ, cervici cujusdam pueri, ad diminuendam ophthalmiam, setacium posuit. Evenit priapismus continuus, et irritationis causam amoveri oportuit. In morbis glandulæ parotidis, partes genitales variis modis afficiuntur. Laqueo suspensi et strangulati plerumque erectionem et seminis emissionem habent. Menstruationis suppressæ a vesicatione cervicis restitutæ exempla dantur. Cervicis frictiones cum spirituosis in hysteriam remedium præclare dicuntur. In erotomania, partes genitales sæpe inflammatæ sunt, sed hæc inflammatio non est idiopathica sed sympathica. Eroticus furor hominis, necnon et equorum, a castratione

* Lib. de Aëribus, Aquis et Locis, Sect. 1.

among mankind than among animals; but the cerebella are always proportionate to the degrees of the propensity.

sanatus est; melius tamen sit, morbum frangere per remedia in inflammationem cerebelli; nam inflammatione sanata, priapismus sedatur. Omnes similes observationes, ad actionem reciprocam colli ac partium genitalium pertinentes, cerebelli functionem probant.

Plurimi fatui sunt qui, quanquam mentis et rationis inopes, tamen veneris stimulum vehementem sentiunt, eorumque amentia masturbationi, cui dediti sunt, vulgo tribuitur. Veneris abusu et nimium copiosa seminis effusione intellectum debilitari, minime negandum est; tamen in hoc casu fatuorum, masturbatio non est causa sed effectus amentiæ. His miseris frons et superior cerebri pars admodum exigua, collum verum et pars capitis posterior grandia sunt; hinc ratione carentes, ut alia animalia, voluptati indulgent. Idem observatur in quibusdam *Cretini* appellatis. Hi sæpe paulum cerebri cum grandi cerebello habent. Non tamen verum est, illorum organa genitalia semper grandiora, eosque admodum lascivos esse. Sic est in multis, sed non in omnibus. In pluribus fatuis atque hydrocephalis valde lascivis cerebelli et partium genitalium magnitudo non est exigua. Hoc vero facile explanari potest. Cerebellum speciale et distinctum systema comprehendit, et hinc functiones cerebri turbatæ atque oppressæ esse possunt, dum cerebellum, per tentorium a cerebro separatum, suis officiis fungi continuatur. Quoniam honor, pudor et ratiocinium desunt, hi miseri veneris appetentiam sequuntur.

Demum gesticulationes seu lingua naturalis hujus propensionis sedem indicant. Postea hanc materiem plenius explicabo. Regulam profitebor ex qua gesticulationes congruunt cum organorum sedibus. Quum copulandi amor nos agit, caput totumque corpus supina sunt; manus in posteriorem colli partem feruntur. Quas amoris gesticulationes, pictores et statuarii sæpe sunt imitati. In avibus atque mammalibus, ante coitum, mares, ut in fœminis copulandi appetentiam incitent, earum colla sæpenumero titillant. Hinc, cum de omnibus hisce exemplis et argumentis cogitamus, cerebellum amoris seu veneris appetentiæ organum esse admittere debemus.

It has been objected, that the brain, in general, is larger in men than in women, and that consequently it is not astonishing that the cerebella of

Nonnulli contendunt, copulandi appetentiam organum proprium habere non posse, quia plurima animalia tantum certis anni temporibus catuliunt. Hæc objectio eandem vim haberet, si contra aliam, quæcunque sit, amoris causam opponeretur; exempli gratia, si sanguinem, aut partes genitales, hujus appetentiæ causam acciperemus. Porro plurima organa non omni tempore officiis suis fungi notum est: mammæ non semper lac secernunt. Idem igitur cerebello accidere possit. Difficilis quidem est quæstio, utrum animalium cerebella, durante rugitu, magnitudine crescant, an magis excitentur. Experimenta desunt; scimus tamen, canum, dum catuliunt, colla insolito modo calescere.

Alii opponunt, vegetabilia sine cerebello propagari: hinc idem in animalibus fieri posse, atque partes genitales sufficientes esse dicunt. —Partes genitales hujus appetentiæ causam sufficientem non esse, jam supra demonstravi. In animalium ac plantarum propagatione comparata, propagatio ipsa cum ejus appetentia confunditur. In vegetabilibus propagatio est simplex fructificatio, actus organicus; in animalibus autem, præter actum organicum, ejus appetentia quoque existit. In plantis atque animalibus procreatio æque se habet atque nutritus. Plantæ nutrimentum capiunt, sed neque esuriunt nec sitiunt, i. e. neque famem nec sitim sentiunt, sicut in animalibus res est. Præterea, animalia nutrimenti saporis quoque conscia sunt, plantæ vero hoc sensu carent. Hinc in plantis, nutritus est simplex, in animalibus tribus functionum speciebus constat: digestione scilicet seu assimilatione, famis et sitis sensatione et gustu. Procreationis eadem est ratio. In plantis est solummodo actus organicus, in animalibus præter testium et uteri actionem organicam, hujus rei appetentia existit, et e coitu animalia delicias capiunt. Atque hujus appetentiæ organum est cerebellum.

Organa, ad eandem functionem pertinentia, sese invicem incitare notum est; sic fames incitat gustum, gustus famem, et ambo incitant digestionem. Sic quoque copulandi appetentia seminis secretionem, et hæc istam incitat. Attamen licet variarum partium incitatio sit mutua, earum ratio non est directa. Digestio appetitui non

men are also larger than those of women. Many individuals, however, have large brains and small cerebella, and *vice versâ*. There is consequently no proportion between the brain and the cerebellum; and this propensity is never in proportion to the size of the brain; but, *cæteris paribus*, always to that of the cerebellum.

Even the position of the cerebellum proves its destination. After hunger and thirst, this propensity is the most common in animals, and it is also the most necessary to the preservation of the species: the cerebellum accordingly is placed in the inferior part of the head. Thus, even on this account its destination is probable. I think, indeed, that this organ and its special faculty are fairly established.

It remains to be determined what name should be given to this propensity. Gall, as already observed, not knowing any special faculty of the mind, considered the actions of man, and, generally, named the organs according to those actions, which he observed to be proportionate to the organs. He

semper respondit, nec appetitus digestioni; itemque nec veneris appetentia seminis secretioni, nec hæc functio illi propensioni semper adæquat.

Ex hisce considerationibus, hujus appetentiæ abusus facillime concipiuntur. Oriuntur enim eodem modo quo abusus famis et sitis. Corporis regenerandi causa nutrimenta sumenda sunt; sed quum nutrimenta, aut e nimia quantitate, aut e mala ipsorum quantitate, saluti obnoxia sunt, evenit abusus. Famem sitimque a quadam organisatione pendere certum est, sed voracitatis ac ebrietatis organum not datur. Res item se habet cum veneris appetentia. Pendet a cerebello; nimia autem cerebelli incitatio, aut ejus conditio viciosa, abusum producit.

accordingly called this the organ of propagation. It is, however, certainly inaccurate to choose a name according to any abuse of an organ; and as there is no organ of gluttony and drunkenness, so can there be none of libertinism. Moreover, I think that no accurate name can be chosen according to the object of a faculty, nor according to any function. It seems to me that every organ must be named according to its special faculty. We do not say, nerves of nutrition, but nerves of hunger and thirst, so here the name should express only the propensity: I therefore propose the name AMATIVENESS.

In order accurately to observe and to substantiate the organs in general, it is necessary to know their places. This particular organ is situated in the neck: discover the mastoid process behind the ear, and the protuberance of the occipital spine above the middle of the neck—the space between these two elevations indicates the extent of this organ in man. The observer will accordingly consider its size in all dimensions, and will compare its developement and the propensity with the actions of love, which may characterize the individual. Those who in various animals wish to distinguish the external developement of the cerebellum by the shape and size of the neck, should be acquainted with the different structure of the cerebellum in mammiferous animals and birds. The cerebella of birds are single, and resemble the vermiform process of the cerebella of quadrupeds, which present lateral parts in addition to the vermiform process.

II. ORGAN OF PHILOPROGENITIVENESS, (*love of progeny.*)

I shall endeavour, according to the method mentioned above, to prove by reasoning that it is necessary to admit a particular organ of philoprogenitiveness; and I shall afterwards state the circumstances which led to its discovery. In some kinds of animals neither males nor females take care of their progeny; but the eggs are resigned to chance, and to the influence of some external agent: this is the case with insects, reptiles and fishes. Even among birds, the cuckoo gives a striking example of this. This bird has a great propensity to physical love; but it neither builds a nest, nor hatches its eggs: it deposits its eggs in the nests of other little birds which live on insects, placing only one egg in any individual nest; and the other birds hatch and nourish the young cuckoo with particular attachment. In some other kinds of animals, the females alone take care of their progeny. Thus bulls, stallions, dogs, cocks &c. are indifferent about their young; while the cow, mare, bitch, hen &c. are extremely attached to them. In other animals again, the males and females form an attachment for life, and both sexes take care of their progeny; this instinct being however more energetic in the females. The fox, which so much resembles the dog, differs from him in this respect: the fox is attached to his female for life, partakes of the same cares with her, and if the female be killed he seeks food for his young ones; yet philoprogenitiveness is stronger in the female than in the male; for, if

both be pursued, the male leaves the young ones sooner than the female. Many birds also are paired, and both males and females take care of the young. These differences are constant: does not each of them, even on the slightest consideration, seem to require peculiar organization?

In the human race, this propensity is, in general, stronger in women than in men. This difference is perceptible not only between fathers and mothers, but also between the sexes in general. A male servant seldom takes such care of children as a female. This difference moreover is sensible not only in grown-up people, but even in children, and accordingly if we present to children various play-things, boys will immediately choose horses, whips, drums &c.; girls, on the contrary, will prefer dolls, cradles, ribbons &c.

In every species of animals, which take care of their progeny, there are some females which do not feel this propensity, while certain males of these kinds excel in this inclination. Even among women certain individuals consider children as a heavy burden, while others deem them their greatest treasure and best source of happiness. This is not the case only among wretched persons, but indiscriminately among rich and poor, and among persons of good and of bad breeding. In general all the proofs which I have adduced of the plurality of the organs may be applied to the organ of philoprogenitiveness in particular. Its existence therefore is necessary.

Dr. Gall observed a distinct protuberance on the

posterior part of the heads of women (*Pl.* VII. *fig.* 1. II.); and in comparing the skulls of his collection, he found a similar elevation on the skulls of children and even on those of monkeys. It was consequently necessary to point out a faculty common to all of them. During five years he was occasionally occupied with this consideration; and he, for some time, thought that it might indicate the greater irritability of women and children; but this supposition he did not long entertain, because irritability is a common quality of every organ. He was however in the habit of suggesting his difficulty, relative to this protuberance, to his auditors, when a clergyman, who attended him, observed that monkeys had a strong attachment to their progeny. Reflecting accordingly on this suggestion, Gall found that this protuberance, which is situated immediately above that of physical love or amativeness, and corresponds with the general protuberance of the occiput, is the organ of philoprogenitiveness. The developement, then, of this cerebral part always coincides with the energy of this propensity. Species, sexes and individuals, which are endowed with a great deal of parental love, have this organ greatly developed; and in women and females, it is, in general, larger than in men and males. Gall possesses the skull of a woman who, being sick, had the confirmed notion of being pregnant with five children; and in this skull, the corresponding organ is extremely developed. There are nations which excel in this propensity, and the developement of the respective organ is proportionate. Thus

Negroes manifest this propensity in an eminent degree, and this organ is in them greatly developed. These are facts which every one may verify.

It is objected that love of children is the result of moral sentiments, of self-love, or of the desire of suckling, and not at all of a particular propensity. These causes, however, so commonly admitted, cannot produce love of offspring: for in many animals which love their progeny such causes do not exist. No animal, below man, has any idea of duty or religious sentiment; and birds do not give suck, yet they love their young. This also is the case with men and males in general. Many mothers do not give suck, and yet they love their children ardently. Moreover, in mothers there is no proportion between moral or religious sentiments, and philoprogenitiveness. Consequently we must admit a particular organ for this propensity.

I have already mentioned that in mankind, and in those species of animals of which the females take care of the progeny, certain individuals are quite indifferent to their young.—(*Pl.* VII. *fig.* 2. II.) Among mankind this phenomenon must be considered as a circumstance indirectly conducive to infanticide. We have examined the shape of the head in twenty-nine women who were infanticides; and twenty-five of them had the organ of philoprogenitiveness very small. The want of this organ does not indeed excite a mother to destroy her child, but a mother destitute of this propensity is less able to resist those external circumstances which provoke her to commit this crime. Such a mother will not resist as strongly as she would have done if her mind

had been influenced by the powerful energy of philoprogenitiveness.

The aim of this faculty is obvious by the care of the progeny. Its activity may be too energetic, and do harm to children by spoiling them; and if it be very small there must follow indifference about them. The protuberance which indicates the developement of this organ is placed in the posterior lobes of the brain, and is commonly single, although the organ itself is double, that is, consists of one on each side. It is single when the posterior lobes of the brain are very near to each other, and double when the posterior lobes are somewhat separate. This difference of form is common to all organs situated in the mesial plane of the head.

By means of this and the preceding organ, it is very easy to distinguish the skulls of males and females of the same kind, and consequently also those of men and women. It is peculiarly worthy of notice that throughout all animals a striking similarity is preserved in the skulls of both sexes; but the skulls of men and males are generally shorter and wider, while those of women and females are longer and narrower.

III. ORGAN OF INHABITIVENESS.

Dr. Gall observed in animals which have a great propensity to elevated stations, as in the chamois and wild goat, a protuberance which he identifies with the organ that in mankind produces pride and

haughtiness.—(*Pl.* IX. *fig.* 1. X.) I think, however, that the instinct to assume physical height, and the sentiment of self-esteem, cannot be ascribed to the same organ. It is certain and must be conceded, that animals which dwell upon mountains, or which are fond of high regions, have one part of their brain more developed than the varieties of the same kinds which live in low countries or in plains; and this difference is quite sensible in roes, hares, rats &c. One species of rat lives in canals, cellars, and the lower parts of houses; another dwells in corn-lofts, and in the higher parts of the houses; and the difference of their organization is very distinguishable. It appears however to me that this circumstance does not authorize the supposition that the faculty, which leads animals to elevated stations, is essentially the same with that which makes man proud and haughty.

Dr. Gall thinks that the point where both organs are situated, *viz.* the organ of self-esteem in man, and the instinct to physical height in animals, is in the same part in the head. He says moreover that this faculty is not the only one which, although physical in animals, is somewhat moral in man; and he quotes the physical love of animals, which grows moral and Platonic in mankind. He supports also his opinion by those natural expressions by which the sentiment of pride is manifested. From the earliest infancy, proud children are pleased with mounting upon chairs in order to be on a level with adult persons; and adults of little stature often do the same in order to gratify their self-love. Proud

persons also keep their body upright, and maintain a haughty gait. In general all expressions of pride and superiority are combined with some physical elevation: thus kings and emperors sit upon elevated thrones &c. &c. Is it then surprising that the same organ should at once preside over physical and moral elevation, since there are so many relations between them? Such is the reasoning of Gall.

It seems however to me that these proofs are insufficient to demonstrate the identity of these two faculties, *viz.* of that which leads animals to physical elevation, and that which gives to man the sentiment of self-esteem and pride. I derive my proofs from anatomy and physiology. Anatomically I maintain that the place of an organ does not prove any thing when animals of different kinds are spoken of; for if different animals be endowed with different faculties, their organs, although different, may occupy corresponding places of the head. Let us suppose three kinds of animals whose faculties are quite different, but whose organs fill up the skull: here it would evidently be absurd to maintain that their faculties were the same because the same number of places on the head were conspicuous. It is true, that when animals possess the same faculty with man, the respective organ is in man and animals situated in the same part of the head. Now to me it does not seem that even the place of the protuberance which indicates that animals like physical height, corresponds with that which in man produces self-love and pride. In animals this protuberance immediately follows the organ of philopro-

genitiveness, but the corresponding cerebral part in man is unknown.—(*Pl.* IX. *fig.* 1 & 2. III.) Hence the comparison of the places of both faculties is rather against than for the assertion of Gall.

The physiological proofs stated above do not seem more to be relied on. Gall says that different faculties which are merely physical in animals become moral in man; and he supports his assertion by the example of physical love. Now I think that no faculty, in so far as it is physical in animals, changes its nature in man, but that all the physical faculties which are common to man and animals preserve their nature in man: consequently, the faculty of physical love, according to my opinion, is always in itself the same. It is obvious, however, that this propensity may be accompanied by other sentiments; and indeed it is so accompanied not only in man, but also in animals. We may observe that many males prefer one female to another, and many females show a similar preference—a circumstance which is evident both in birds and in quadrupeds. Sometimes a bull is particularly attached to one individual amongst a herd of cows. I have also seen canary-birds which could not live with certain individuals, and which, though separated, remained attached to their former mates. Moreover, if the organ of physical love alone be active in man, it acts always without morality, as in hydrocephalic persons and idiots from birth: the physical love of these individuals entirely resembles that of animals in general. Hence whatever is moral in physical love depends on other faculties which may accom-

pany this propensity; and indeed it is observed that man and animals modify the manifestation of this propensity, in proportion as they are endowed with other faculties. Thus if a man or an animal be prone to attachment and physical love together, both faculties will act together, and physical love will be modified by attachment, and attachment by physical love.

It is replied, that Platonic love finishes ordinarily by physical love. I agree in this; but is it possible to conclude that Platonic love is the same as physical love? I am not hungry because I have taste or smell; but if smell be stimulated by any odour, and if thereby the sense of taste and the feeling of hunger be excited, and notwithstanding my first intention I eat, will it be maintained that smell and the desire to eat are the same? If we examine Platonic or moral love, we find that all the sentiments which we feel at the same time with the propensity to physical love, may be attributed to the other special faculties and their respective organs. In the same manner it seems to me, that it is impossible to confound the instinct of physical height, with the moral sentiment of self-love and pride: I believe it possible to have a great opinion of one's own person in all regions and countries.

Finally, the expressions or external manifestations of haughty persons, as their mounting upon chairs in order to be physically higher and ideally greater; this behaviour of children in order to be on a level with adult persons; the haughty gait of proud persons &c. do not at all prove the identity of the

organs alluded to. Let it be examined what kind of proud childrën mount upon chairs and tables in order to show their height, and I am sure they will be found to be children to whom certain things have been interdicted because they are still little, or, in general, children who have observed the advantages of grown-up persons, or in whose presence adult age has been praised. Say to such individuals that those who are placed at the head of the company, or at its lower part, occupy those places by way of distinction, and they will endeavour to occupy the place which is praised. All other external manifestations of proud persons may be explained according to the general principle of pathognomy, which shows that our gait and all the motions of the body in general, and of the head in particular, are conformable to the seat of the organ which is active. The organ of pride is situated upwards and backwards; and hence all motions of pride take place in this direction.

Thus, I separate the instinct which carries animals to physical elevation from the sentiment which produces self-love and pride, and I seek for two different organs. It is however denied that animals which like elevated situations are led there by an internal instinct attached to some particular organ; and it is said that these animals frequent these places in order to look for their food. But some of these animals like situations where there is no food; and thus the chamois and wild goat dwell upon the tops of rocks which are entirely barren, and are obliged to descend into the middle regions in order

to find their food. There are other animals again which like the higher regions of the air, and which yet seek their food upon the earth. Thus eagles and hawks hover high in the air, and catch mice upon the ground. Does the lark need to ascend into the air in order to sing? In treating of the innateness of all the faculties, I shall show that it is very unphilosophical to attribute the origin of any faculty of man or animals to external wants, though it must be allowed that external wants excite internal innate faculties. We must admit, therefore, some particular propensity which leads animals into higher regions.

In examining the habits and manners of living of various animals, it is obvious, that different kinds of animals are attached to different regions and countries. Nature which intended that all regions and countries should be inhabited, assigned to all animals their dwelling, and gave to every kind of animal its respective propensity to some particular region. If we place any animal in another region, it leaves it and returns to its natural dwelling. Some animals seek the water from the first moment of their existence; and thus, turtles and ducks as soon as they are hatched run towards it; while other young animals stay upon dry land. Some of these like high regions, some the low countries and plains, and others the marshes. Among the inhabitants of the air, some species live in the higher and others in the lower regions; nor does the power of flying alone produce the instinct of hovering in the high regions of the air, for many kinds of

animals, although their power of flying is great, are destitute of this instinct. Some birds also build their nests on the top of trees, some in the middle parts, and others in holes of trees, on the earth, on the banks of rivers &c.

In conformity with all these considerations, it seems to me that there is a particular faculty, and a special organ, which determines the dwelling of animals. It is difficult, however, to point out the seat of this organ. It is in this respect impossible to compare land and water animals, because both orders must have an organ modified according to their sort of this instinct; just as is the case with the senses of smell and taste in carnivorous and herbivorous animals, which both possess these senses, but differently modified. Thus must the propensity of inhabitiveness exist in land and in water animals. It is therefore necessary to compare only different varieties of animals which inhabit the same element or region, and chiefly individuals which excel in this respect. The place of this organ is merely conjectural, and must be verified in the same way as that of every other organ. This propensity, however, is common to the greater number of animals: hence its organ must be deep-seated in the brain, and must be looked for in the region of the other propensities; while self-love is a sentiment, and its organ occupies a higher place in the head.

IV. ORGAN OF ADHESIVENESS.

Friendship has long been considered as the result of reflection, as the consequence of some analogy between the faculties, or as an effect of mutual interest. Yet it is necessary to admit some particular instinct, which produces various manifestations of attachment in animals in whom no moral argument, nor any interest, can take place. This seems to be evident from certain examples among dogs; all of them not being susceptible of the same degree of attachment, though their external treatment ought to excite it: some dogs, on the contrary, are attached in opposition to their interest; and though sometimes they are ill-treated, yet remain attached to their master. Moreover, there is something involuntary in this sentiment; and its manifestations are too early and too sudden to result from any reflection. Even criminals have sometimes a great degree of attachment to their accomplices; and some among them have been known to destroy themselves rather than denounce their companions: thus a highwayman confined in the prison of Lichtenstein, near Vienna, hanged himself that he might not be forced to betray his accomplices.

These considerations prove the necessity of some organ of attachment. It is difficult however to point out its seat in man; for the actions in men are not sufficiently free, but are sometimes only embellished by the appearance of this sentiment. Gall seldom speaks of this organ. He examined, however, the head of a woman at Vienna, who

was known as a model of friendship. She suffered different changes of fortune; she became alternately rich and poor; but was always attached to her former friends. In her, Gall found the part of her head situated upward and outward from the organ of philoprogenitiveness, very prominent, and called it the organ of friendship. This part of the brain is commonly more developed in women than in men. Our observations are not multiplied enough to enable us to decide positively respecting this organ; yet its seat seems to me to be more than probable. It must be situated inferiorly, because this faculty exists in the lower animals, and is a propensity. For this reason it must belong to their region of the head; and according to its mimical signs and the motions of the head when it is active, it appears to lie laterally and backward.—(*Pl.* IX. *fig.* 1 & 2, IV.)

What then is the special faculty of this organ? In considering the actions of man and animals, it may be observed that there is a great difference between different species, and even between different individuals of the same kind, in respect to attachment. If animals have a propensity to physical love, like their progeny, and have a determinate dwelling, we then see that in several kinds of animals, the males and females are attached to each other, and live domestically. This, for example, is the case with the fox and with many birds. The fox lives with its female, while the dog lives in polygamy, like the cock, bull and stallion. Without some particular attachment, males and females

would leave each other as soon as the instinct of physical love was satisfied, but nature by another instinct, prevented this separation. There is still another modification of attachment, namely, society, in which individuals of one kind are attached to each other and live together, while other animals live isolated. Here it is to be observed that the instinct of being attached for life, and that of living in society, are not mere degrees of energy, so that a lower degree produces attachment for life, and a higher degree for society. For there are animals which live in society without being attached for life, as the bull, dog, cock &c.: others live in society and in family, as starlings, ravens, crows &c: others again are attached for life without living in society, as the fox, magpie &c. The instinct therefore of living in society, and that of living in family, are modifications of their proper nature, in the same way as smell and taste are modified in carnivorous and herbivorous animals. Man belongs to the amimals which are social and attached for life; and hence it results that society and marriage are not at all the effect of human reflection, but of original nature.

It seems to me that this special faculty extends its sphere of activity still farther, and that it gives us attachment to all around us, to inanimate beings, plants, animals and man, in short to all that we possess, whether animate or inanimate. It produces also the sentiment of habitude. Friendship consequently is only one of the modifications of this faculty. If attachment for life belong to some por-

tion of this organ, it must be to that which is nearest to the organ of philoprogenitiveness. In conformity, then, with all the preceding considerations, it seems to me that the name adhesiveness or attachment denotes this special faculty, which presents several modifications, and of which the objects are friendship, marriage, society and attachment in general. Abuse results from its too great energy, in nostalgia, or in regretting too deeply the loss of a friend &c. Without attachment men become anchorites and hermits.

V. ORGAN OF COMBATIVENESS.

I have mentioned above, that Dr. Gall, having called together boys from the streets, occasionally made them fight: there were of course some who were fond of it, and others who, on the contrary, were peaceable and timid. In the former, that part of the head which corresponds to the posterior inferior angle of the parietal bone, behind the mastoid process (or, in grown up persons, generally about one inch and a half behind the ear) was prominent (*Pl.* IX. *fig.* 1. V.), and in the latter, the same place was flat or depressed.—(*Pl.* IX. *fig.* 2. V.)* The prominence was also found in the heads of brave and valiant officers, of quarrelsome students, of duellists, and of those whose greatest pleasure

* This must not, however, be confounded with the mere bony prominence immediately before it. That serves only for the attachment of a muscle.

consisted in fighting and making themselves feared. This organ is generally more developed in men and males than in women and females, though in certain women I have also seen it very large. Gall, at first, named this organ that of courage; but afterwards, considering that it is possible for a man to have courage to do any thing of which he thinks himself capable, for instance, to dance, play on an instrument, or sing, when he may possess no propensity to fight, he called this the organ of quarrelsomeness: he now calls it that of self-defence.

This propensity is active in different degrees, not only in mankind but also in different species of animals. There are animals which never fight; while others are fond of it: rabbits, for instance, are more courageous than hares. Even individuals of the same kind differ entirely with respect to this faculty: thus one dog looks incessantly for an opportunity of fighting, while another always flies away. The courageous animals have the head between and behind the ears very large.—(*Pl.* X. *fig.* 1 & 3. V.) This is an unfailing sign to distinguish or recognize, if a horse be shy and timid (*Pl.* X. *fig.* 4. V.), or bold and sure.—(*Pl.* X. *fig.* 3. V.) The same difference is observed in game cocks and game hens, in comparison with domestic fowls. Horse-jockies, and those who are fond of fighting cocks, have long made this observation.

It is objected that this propensity is the result of bodily strength. There are however several species which, though weak, are fond of fighting, while others, though large and strong, avoid it. We may find striking examples of this among dogs; the

fighting cock also is less than the dunghill cock: and hares are stronger than rabbits, yet less courageous. Among men, and even among delicate women, we find individuals who are very weak, but intrepid and courageous, while tall and robust individuals are sometimes destitute of this propensity.

The desire of fighting is necessary to animals as soon as they are attached to females, to progeny, to friends, or to dwellings; for, according to the arrangement of nature, it is necessary to fight in order to defend. This propensity must, then, exist for the purpose of defence. It seems, however, to me that this faculty is, like all others, of a general kind, and not limited to self-defence; and I therefore call it the organ of the propensity to fight, or of combativeness. Sometimes this propensity acts with greater energy than it ought—it is delighted with combats; and then it produces dispute, quarrelsomeness and attack, *viz.* abuses.

It may be inquired whether the want of this organ produces fear. Gall indeed thinks so; but it appears to me, that the absence of any organ cannot produce a positive sentiment, like fear. It is certainly conceivable that the absence of any organ may produce modifications in the manner of thinking and feeling; and thus the absence of this propensity renders a character peaceable; but I imagine that, in fear, a positive action must take place. Hence I think that Gall is in general wrong in speaking of negative qualities. If fear be the result of the absence of courage, I cannot conceive how it is possible to be at the same time courageous and fearful; yet this happens both in animals and man.

kind. We shall see afterwards that the sensations of fear and anxiety are ascribable to the organ of cautiousness.

VI. ORGAN OF THE PROPENSITY TO DESTROY, OR OF DESTRUCTIVENESS.

A difference in the skulls of carnivorous and herbivorous animals gave the first idea of the existence of this organ. If we place a skull of any carnivorous animal horizontally, and trace a vertical line through the external meatus auditorius, a great portion of the cerebral mass is situated behind that line; and the more an animal is carnivorous, the more considerable is the portion of the cerebral mass situated there.

It is objected that it is useless to admit in the brain a particular organ of destruction, in order to determine the kind of food man and animals live upon; because nature has given to carnivorous animals the feeling of hunger, the taste, teeth and instruments necessary for seizing and masticating their prey. These external instruments, however, prove only the harmony between internal faculties and external instruments in general. Man has hands in order to take his aliments, but some interior sensation advertises man and animals of the necessity of taking food. The tiger, lion, cat &c. have teeth and claws, but an internal power excites them to use them. A sheep could not employ such in-

struments any more than an idiot could employ his hands to perform things for which they might be fit, but which his reason could not direct. Thus an internal propensity must make use of the external instruments, and this propensity is attached to a particular organ.

The propensity to kill exists beyond doubt in certain animals; and it is more or less energetic in animals of different species, and even in the individuals of the same kind. There are some species which do not kill more than they need for their nourishment, while others, as the wolf, tiger, polecat &c. kill all living beings around them, and that seemingly for the pleasure of killing alone. One dog scarcely has this propensity, while another possesses it in a high degree. Gall had a little dog which had this propensity in so high a degree, that he would sometimes watch several hours for a mouse, and as soon as it was killed he left it: notwithstanding repeated punishment he had also an irresistible propensity to kill birds. In short it cannot be doubted that different animals have the propensity to kill. Is man also endowed with this faculty?

If carnivorous animals have the propensity to kill, man, being omnivorous, ought to have it also. There is indeed no carnivorous animal which eats so many kinds of animals as man does: animals are confined to a certain number of species for the choice of their food, but man lives upon all, and anthropophagi even upon their fellow creatures: he kills from the insect to the elephant and the whale, in order to apply them to his purposes. It is said

that man eats flesh only from depravity of habit; but in examining the teeth of man, it is evident that they partake of the structure both of those of carnivorous and of herbivorous animals. It is the same with the stomach of man: it differs much from the stomach of herbivorous animals, and, in several circumstances, resembles that of the carnivorous.

In man this propensity presents different degrees of activity, from a mere indifference to the pain of animals, to the pleasure of seeing them killed, or even to the most irresistible desire to kill. This doctrine may shock sensibility, but it is not the less true. Whoever endeavours to study nature and judge of its phenomena must admit the existence of things as they are. It may be observed that in children as well as in adults, among the uncultivated as well as among the polite and well bred classes of society, certain individuals are sensible, and others indifferent, to the suffering of others. Some persons feel a pleasure in tormenting animals and in seeing them tortured or killed, even when it is impossible to ascribe this disposition to bad habit or bad education. There are even individuals who choose their profession according to this propensity, if it be very energetic. A student often shocked his school-fellows by his extraordinary pleasure in tormenting insects, birds and other animals; and in order, as he pretended, to satisfy this inclination he became a surgeon. A journeyman apothecary, at Vienna, felt so great a propensity to kill, that he became an executioner:—the son of a rich merchant, of the same city, gave up commerce and became a

butcher:—and a rich Dutchman paid the butchers who furnished the navy with beef, for permission to kill the oxen.

We may also determine the existence of this propensity, and its diversities, by the impressions which different spectators receive from public executions. The view of them is insupportable to some individuals and delightful to others. Accordingly George Selwin sought for such spectacles, and always endeavoured to stand near the executioner; and it is reported of La Condamine that, being fond of such spectacles, on his at one time endeavouring to pass through the crowd, as the soldiers pushed him backward, the executioner said to them, Let that gentleman pass, he is an amateur. Mr. Bruggmans, Professor at Leyden, told us of a Dutch priest who had so violent a desire to kill and to see animals killed, that he became chaplain of a regiment solely in order to have an opportunity of seeing men destroyed; and the same clergyman kept in his house a great number of different domestic animals, as cats &c. in order to satisfy his natural propensity by killing their young: he also killed all the animals for the use of his kitchen. He was moreover acquainted with the hangmen of the country, received notice of each execution, and travelled on foot for several days in order to witness it, when the executioners always placed him near them. In the field of battle we find a great difference in the energy of this propensity: one soldier is overjoyed at the sight of the blood which he sheds, while another, moved by compassion, gives uncertain

blows, or at least spares the vanquished, and stops of his own accord after the victory.

There are highwaymen who are not content with robbing, but who manifest the most sanguinary inclination to torment and kill without necessity. John Rosbeck was not content with maltreating his victims in order to make them betray the place of their concealed treasures, but invented and employed the most outrageous cruelties merely to witness the sufferings of children, of women and of old persons. Moreover neither fear nor torture could correct him. On his being first caught he was for eighteen months shut up in a small subterraneous dungeon, his feet were loaded with chains, he stood in muddy water up to his ancles, and when dragged out of this place he was cruelly tortured; nevertheless he did not confess any thing. He was afterwards enlarged; the first thing he did, when free, was to steal in full day-light; and having soon committed new murders, he was executed.* At the beginning of the last century several murders were committed in Holland, on the frontiers of the province of Cleves. For a long time the murderer remained unknown; but at last an old fiddler, who was accustomed to play on the violin at country weddings, was suspected in consequence of some expressions of his children. Led before the justice, he confessed thirty-four murders, and he asserted that he had committed them without any cause of enmity, and without any intention of robbing, but only because he was

* History of Schinderhannes, tom. ii. p. 8.

extremely delighted with bloodshed. At Strasbourg two keepers of the cathedral were assassinated; for a long time the murderer remained undiscovered; but at last a postillion was killed by a pistol shot by a clergyman, called Frick. This monster, in order to satisfy his horrible propensity to murder, had hired a post-chaise for the express purpose of killing the postillion. He was arrested; confessed that he was the murderer of both keepers of the cathedral; and without changing countenance acknowledged that when yet a student he had often enticed children to follow him into the woods, that there he had hanged them on trees, had kindled a fire under them, and so destroyed them. Now this criminal was rich, and had never stolen: for his crimes, however, he was burnt alive at Strasbourg. "Louis XV." says M. de Lacretelle,* "felt a rooted aversion against a brother of the Duke of Bourbon-Condé, Count of Charolois, who would have renewed all the crimes of Nero had he occupied a throne. While yet a child he betrayed an instinct of cruelty which excited horror; and was delighted with tormenting animals, and with violently treating his servants. It is also related that he delighted in shedding the blood of those he had debauched, and that he exercised various kinds of barbarities on the courtesans who were brought to him. Popular tradition, corresponding with several historical relations, accuses him of different homicides. It is said that he committed these murders without interest,

* Histoire de la France, tom. ii. p. 59.

without anger, and without vengeance; shooting even at tilers in order to have the barbarous pleasure of seeing them falling from the tops of the houses."

These latter facts, which fortunately are very rare, prove that this terrible propensity is sometimes quite independent of education, of examples, of seduction, or of habit, and that it depends on organization alone. Indeed there are crimes of so high a degree, and accompanied with such repugnant and horrible circumstances, that it would be impossible to explain them in any other way. Prochaska relates * that a woman of Milan flattered little children, led them home, killed them, salted their flesh, and eat of it every day; and he also quotes the case of a person who, excited by this heinous propensity, killed a traveller and a young girl, in order to eat them. Gaubius † speaks of a girl whose father was incited by a violent propensity to eat the flesh of man, and who for this purpose committed several murders. This girl, though separated from her father for a long time, and though educated carefully among respectable persons, who had no relation to her family, was overcome by the inconceivable desire of eating the flesh of man.

Some idiots manifest this propensity to kill or to destroy. An idiot, after having killed two children of his brother, came smiling and announced the action to him. Another, excited by anger, mur-

* Opera Minora, tom. ii. p. 98.

† Oratio Prima de Regimine Mentis quod Medicorum est.

dered his brother, and intended to burn him openly and ceremoniously before the house. A third, according to Herder, after having seen a hog killed, thought he had a right to murder his fellow-creatures, and actually cut the throat of a man. We ourselves have seen in prison a young man whom nobody considered as silly, and who without any motive killed a child. Different questions were put to him, and he was threatened with various punishments in order to obtain a knowledge of his motive; but he only answered and incessantly repeated, that he saw nothing but black: "Whoever," said he with a lamentable voice, "was not present cannot believe me.—God will pardon me." At Fribourg, in Brisgau, we saw a young man of fifteen years of age confined in prison because he had set fire to nine houses successively; he even helped to quench the fire; and, on one occasion, he saved a child who was nearly destroyed by the flames. When the fire was extinguished he thought no more of it: his conduct was therefore excited only by some bestial instinct; indeed he was half an idiot.

Certain madmen are alienated only in respect to the propensity to murder. At Berlin, Mr. Mayer, surgeon of a regiment, showed us a soldier whose body was very irritable and much weakened by the loss of his wife: he suffered every month a fit of violent convulsions; he felt their approach; and at the same time had an immoderate propensity to kill: then he begged instantly to be loaded with chains; but at the end of several days, the fit and the fatal propensity diminished; and he himself fixed

the period when without danger he might be delivered from his chains. At Haina we met with a man who, at certain periods, felt an irresistible desire to maltreat other persons; he also knew his unfortunate propensity, and begged to be loaded with chains till his fit was over. A melancholy person having seen the execution of a criminal, the spectacle produced in him so violent an emotion that he was suddenly seized with a propensity to kill. At the same time he preserved the strongest aversion to such a crime; weeping bitterly, he described his deplorable situation with an extreme confusion; he struck his head, wrung his hands, exhorted himself, and cried to his friends to take care and to fly; and he thanked them if they resisted and menaced him.

Pinel has also observed, in various mad persons, the fierce impulsion to destroy: and he speaks of one who did not show any mark of alienation in respect to memory, imagination and judgment, but who confessed that, in his narrow seclusion, his propensity to murder was quite involuntary and utterly irresistible, and that his wife, notwithstanding his tenderness for her, was near being immolated, he having time only to warn her to fly. In his lucid intervals he made the same melancholy reflections, he expressed the same remorse, and he was disgusted with life to such a degree that he several times attempted to put an end to his existence. "What reason," said he, "have I to cut the throat of the overseer of the hospital who treats us with the greatest humanity? yet in the moments of my fury,

I feel a desire to attack him in the same way as other persons, and to thrust a dagger into his breast." Another madman for six months in the year suffered periodical fits of fury: he felt the decrease of the symptoms, pointed out the periods when the danger was over, and begged those about him not to let him free if he felt an incapacity of governing his blind impulse to destroy: in his calm intervals he confessed, that during his fits of fury it would be impossible for him to restrain it; that if he met any one it appeared to him that he saw the blood circulate in the vessels of those persons, and that he felt an irresistible desire of sucking it, and of tearing their limbs with his teeth in order to suck it more commodiously. Pinel relates also the history of a young alienated person who every morning felt a fit of mania, during which she tore all that fell under her hands, and committed every sort of violence against all who came near her, so that they were obliged to restrain her by a strait jacket; yet in the afternoon she repented of the actions of the morning, and despaired of being pardoned. Pinel quotes another example of a monk whose understanding was alienated by devotion so that he thought he had one night seen the Virgin Mary surrounded with a choir of angels and happy spirits, and had received an express order to kill a certain person whom he considered as an infidel; and he would have executed his project had he not betrayed himself by various actions, in consequence of which he was shut up. The same author speaks also of a certain credulous vine-dresser, whose imagination was so violently

skaken by the sermon of a missionary, that he thought himself and his family were damned to everlasting pains, and considered the baptism of blood, or martyrdom, as the only means of saving them. He therefore first endeavoured to murder his wife, who with difficulty escaped; then he exercised his insanity in very calmly killing two of his children in order to procure for them eternal life; and when confined in prison in order to be judged, he cut the throat of a criminal who was with him in the same room, still with the intention of doing some expiatory action. His alienation being proved, he was condemned to be shut up in the Bicêtre for life: there long solitary detention exalted his imagination; and because he had not been executed, he fancied himself the Almighty or, according to his own expressions, the fourth person of the Trinity, and that he was sent to save the world by the baptism of blood. Having been confined during ten years, and being now continually calm and quiet, he received permission to converse with the other convalescents in the court of the hospital. He passed four years tranquilly in this way, and his healthy state seemed to be restored, when he suddenly manifested his former superstitious and sanguinary ideas. The day before Christmas, he conceived the project of doing some expiatory sacrifice by killing all those who might fall under his hands: he consequently got a shoemaker's knife, and at the moment when the keeper went the rounds, he gave him a thrust from behind, which fortunately slipped over the ribs; he cut the throats of two other madmen; and he

would have continued his homicide had he not been arrested by force.

These and many similar examples, observed in the healthy and diseased state of man—in idiots and madmen—prove evidently that the propensity to kill and destroy is innate, not only in animals but in man. Does not, indeed, the whole history of mankind confirm this assertion? In all ages the earth has been drenched with blood.

It is now to be examined with what view nature has created this propensity. We cannot imagine that this propensity is innate in order to murder man. Carnivorous animals are endowed with this propensity, but they do not kill other individuals of their own kind; they kill other animals in order that they themselves may live. In what then does the food of man consist? He lives on other animals; and therefore he must kill them. Thus it may be questioned whether this propensity determines the sort of food, that is, flesh? Gall thinks so: I do not. It is certain that the propensities are in relation to the whole nature of animals, and that the propensity to kill is in relation to the food of every species of animals; but the power which desires to kill is not the same as that which chooses flesh. One special faculty produces the propensity to kill, and another faculty makes choice of flesh. On this account, there is no proportion between the propensity to kill, and the want of food. Some animals kill more than is necessary for their nourishment. Some persons like meat, but they cannot kill any animal; other persons have no reluc-

tance to kill, and yet prefer vegetables for nourishment. Children, in general, have this propensity more energetic than adult persons; yet they prefer fruits to meat. Hence it must be allowed that this propensity is necessary to carnivorous animals; not that they are carnivorous because they have this propensity.

It remains still that we should examine what is the essential nature of this faculty? I think that its sphere of activity is more extended than the instinct to kill. It seems to me that this faculty produces the propensity to destroy in general, without denoting any object. Destruction may be applied to inanimate things, to animals, or to man; and in this signification, this faculty may be necessary and destined from creation. It must certainly be granted that throughout all nature one being lives upon another, that violent death is an institution of nature, and that there are animals of prey among all orders of animals. Now if nature had created animals which ought to live upon meat without giving to them, at the same time, the instinct of killing animals, it would be contradictory and absurd. Moreover, nature has even taught carnivorous animals to kill others in the most certain and sudden way, that is, by wounding their neck at the place of decussation. Sometimes it is necessary to destroy what is useless in order to replace it by what is useful; and there are many things which are relatively hurtful, which we are provoked to destroy. In this sense it is lawful to destroy others in order to save ourselves; and in this sense de-

struction is not only permitted by justice, but it is even rewarded as a virtue. On the contrary, whenever this faculty destroys what ought not to be destroyed, an abuse of it takes place; as, in murdering and assassinating man, in setting fire to houses &c.

This faculty then produces the propensity to destroy, in general, without determining the object to be destroyed, or the manner of destroying it: it gives the propensity to pinch, scratch, bite, cut, break, pierce, devastate, demolish, ravage, burn, massacre, strangle, butcher, suffocate, drown, kill, poison, murder and assassinate. Gall formerly called the organ of this faculty the organ of murder, because he found it much developed in two murderers; but it is evident that a name cannot be given to any faculty according to its abuse. This misnomer arose from the circumstance that the organs can be discovered only when they are extremely developed: but in the highest state of developement many faculties produce abuses. Such was the origin of this too limited term, erroneously derived from the abuse of a faculty of which the well regulated employment is, like that of all other faculties, essential to life. I think that the name, organ of the propensity to destroy, or of destructiveness, is the most general and the most conformable to the sphere of activity of this faculty. We are convinced, by a great number of observations, that the seat of this organ is on the side of the head immediately above the ears. (*Pl.* IX. *fig.* 1 & 2. VI., and *Pl.* XI and XII. *fig.* 1 & 2. VI.) It is

commonly larger in men than in women: yet there are exceptions from this rule.

VII. ORGAN OF THE PROPENSITY TO BUILD, OR OF CONSTRUCTIVENESS.

Gall observed, that those who had a particular disposition to mechanical arts presented a face of somewhat parallel form, or as large at the temples as at the cheeks; and consequently that a greater disposition to mechanical arts is indicated by the developement of the brain at the temples.—(*Pl.* XIII. *fig*. 2. VII.) He found this sign in great mechanicians, architects, sculptors and designers. The skulls of animals which build, and those of others which do not build, present a remarkable difference at the place where this organ is situated. This is exemplified in the skulls of rabbits and of hares; and accordingly it is known that rabbits build burrows, while hares, which yet generally resemble rabbits, lie in the fields. In the beaver, marmot, field-mouse &c. this organ is distinctly expressed.

A certain skull is preserved at Rome which is said to be the skull of Raphael; but there exists some doubt of its reality. Professor Schell, of Copenhagen, brought a cast of this skull in plaster to Gall, and asked him his opinion of it. Gall answered that three organs were in it very considerable; that the organ of mechanical arts was more developed than he had ever seen it before, and that the organ of imitation, and also that of physical love, were very

large. Gall possesses the skull of a milliner of Vienna, who had a good taste, and understood perfectly to change the forms of her merchandises; and in this skull the organ in question is prominent.

Adversaries of our doctrine may ridicule a comparison between Raphael, a milliner, and a field-mouse. They may laugh at a doctrine which, as they conclude, attributes to a similar organ the sublime conceptions of Raphael, the petty devices of a milliner, and the inartificial habitation of a field-mouse. But does not the sloth creep by means of organs similar to those by which the horse can gallop, and the roe can run? Does not the ass bray by means of organs similar to those by which a Catalani sings? It is indeed true that this faculty alone does not produce the sublime conceptions of Raphael; yet it was essential to the execution of their objects.

It seems to me that this faculty produces every thing that may be called construction. By means of it birds build nests for their young, rabbits and other animals make burrows, and the beaver its hut; and in mankind all propensity to construct, from the huts of savages to the palaces of kings and the temples of God, is the result of this faculty. It produces fortifications, ships, the engines of war, of manufactures and commerce, instruments of all kinds, furniture, clothes, toys &c. This faculty is essential not only to every mechanical profession, but to all that, in any way, require construction, as the arts of drawing, engraving, writing, carving, and sculpture. Lock-makers, watch-makers, joiners, cabinet-makers, turners &c. are directed by this fa-

culty. Thus it seems to me that the propensity to construct, or constructiveness, is the special faculty of this organ, which does not however determine its object. I know a lady at Paris, who, every time when she was with child, had this organ excited, and felt the greatest propensity to build. Too great a developement of the organ may produce too great a propensity to build, or an abuse. A man, for instance, may ruin his family by building, or may employ this faculty in coining false money.

VIII. ORGAN OF THE PROPENSITY TO COVET, OR OF COVETIVENESS.

Certain persons have a particular propensity to steal or rob. It is well known that Victor Amadeus I. King of Sardinia, pilfered every where objects of little importance. Saurin, Pastor at Geneva, though acquainted with the best principles of reason and religion, was overcome continually by the propensity to steal. Another individual of good breeding was from infancy given up to this inclination; betook himself to the military service in hopes of being restrained by the severity of its discipline; and, as he continued to steal, was in danger of being hanged: struggling still against this propensity, he studied theology and became a Capucin; his propensity followed him into the convent, and he took trifles, such as candlesticks, snuffers, scissars, drinking-cups and glasses; but not concealing the stolen objects, he acknowledged that he had taken them home that the proprietors might have the trouble of

carrying them to their houses again. A person employed by the government of Austria, and established at Presbourg, had filled two chambers with stolen furniture, but he never dared to make use of it. The wife of Gaubius, the famous physician at Leyden, had in so high a degree the propensity to steal, that, when making purchases at shops, she always endeavoured to take something away; so that her husband ordered a servant to follow her, to prevent or to compensate for her theft. The Countess M****, at Wesel, and J****, at Frankfort, manifested the same propensity. Madame de N*** had been educated with great care, and her understanding and talents assured to her a distinguished place in society, but neither her breeding nor her education secured her against the powerful propensity to steal. Lavater speaks of a physician who never left the rooms of his patients without putting something into his pocket, as keys, scissars, knives, spoons, thimbles, buckles and boxes; but who sent them back again to their owners. Moritz, in his treatise on the human mind, relates, with much detail, the history of a certain thief, whose propensity to steal was so energetic, that even when dying he stretched out his hand in order to steal the snuff-box of his confessor. Dr. Benard, physician to his Majesty the King of Bavaria, related to us the history of an Alsacian who was rich, and not at all avaricious, but who had a great propensity to steal: he had been educated with great care, and sometimes severely punished on account of stealing; in order to suppress which his father caused him to become a soldier,

and as he continued to rob he was hanged. We have the history of the son of a very learned man, who excelled his comrades at the schools, but from his earliest infancy stole from his parents, sisters, brothers, servants, comrades, school-fellows and professors: all sorts of correction were useless to him; for being, as a punishment, given up to military service, he several times suffered severe inflictions, but all without changing his character: in all other respects, his behaviour was regular, but in this he was entirely indifferent to the most energetic exhortations; he looked as if he did not hear his advisers; and they were ultimately obliged to confine him in prison. The chaplain of a regiment in Prussia, a man of great intelligence and ability, could not avoid stealing handkerchiefs from the officers at the parade: the commanding officer esteemed him much; but as soon as the chaplain made his appearance, all cabinets, presses and cupboards were shut up; for he had carried off handkerchiefs, towels, shirts and even women's stockings; yet he, with pleasure, gave back the stolen things. We saw, at Copenhagen, a prisoner, who was an incorrigible thief, but who sometimes distributed the things he had stolen among the poor. Another thief was shut up for the seventh time, who confessed that it seemed to be impossible to change his behaviour; and he therefore begged earnestly to be kept in prison, and that he might have the means of earning a livelihood. A young Calmuck, brought to Vienna, by Count Stahrenberg, Ambassador of Austria at the Court of Petersburg, became melancholic, and fell into a

nostalgia, because his confessor, who instructed him in religion and morality, had forbidden him to steal: the confessor, a man of understanding, discovered the cause of his disease, and gave him permission to steal on condition that he would give back what he had stolen: the young Calmuck profited by this permission, and stole the watch of even his confessor during the consecration of the mass; but, leaping with joy, he gave it back after the mass was over.

It would be easy to multiply examples of this kind almost to infinity; and they prove that the instinct of stealing is not always the effect of bad education, of poverty, idleness, or of the want of religion and moral sentiment. This truth is so generally felt that every one winks at a little theft committed by rich persons who in other respects conduct themselves well. These thefts are then said to be the consequences of mental abstraction. Moreover, the propensity to steal is proved by a state of disease. We knew several cases in which pregnant women have felt this propensity in a high degree only during pregnancy; and certain individuals manifest the propensity to steal only if their mind be alienated. Hence it is obvious that the faculty of this propensity must be innate. We have examined the heads of a very great number of thieves; and it is unquestionable that those who manifest a great propensity to steal, present one part of the brain greatly developed, while in other persons, who are destitute of this inclination, that part is small in proportion to the other cerebral parts.

The idea, however, of considering stealing as a

natural propensity is so contradictory to common opinion, that it is impossible to avoid all objection to it. It may be objected that stealing presupposes the existence of property; that property is the result of society and social convention; that consequently stealing is not supported by any natural propensity; and that it is absurd to admit an organ of theft. In this objection there are two things to be considered; and first, it must be examined whether property itself is not grounded upon some natural and particular instinct? In treating of the innateness of the faculties, I shall show that many actions which are considered as the effect of society, or as factitious, result from particular innate faculties. Besides, we have seen that society itself is the result of a particular instinct, hence all other faculties are combined with this propensity. It is moreover easy to demonstrate that the sentiment of property is natural and not at all factitious. Even animals possess it: birds have their own nests; many quadrupeds their burrows and dwelling-places; and all animals defend their habitation against foreign aggression. Tame animals also know their own places in stables; and if they go out and return home, every one takes its place. Nightingales, red-breasts &c. have their districts, and drive away all other individuals of their kind, even their young ones when grown up. The constancy of storks and swallows is known in respect to those places of nestling of which they have taken possession. Bees and all insects fight even till death to defend their hives against intruders. Every one knows that a dog

defends his bone with more courage in the house of his master, than in the house of a stranger. Sportsmen and hunters know, that in a certain district there is only a certain number of animals of the same kind, which do not permit other individuals of that species to take possession of the same part of the country. This is the case even with certain social animals: every herd of chamois, for instance, occupies one district, and drives away all other herds. The same takes place with man. Let us suppose two persons living in a state of nature: if one gathers fruits which the other endeavours to eat, will not the former feel that the fruits are his own? Such examples might be multiplied innumerably; and they clearly prove that the sentiment of property is natural in animals and man,—that it is anterior to all legislation. In animals this sentiment submits only to strength or to force; but man, who is susceptible of morality and justice, determines the laws according to which an object is property or not. Consequently, the sentiment of property has produced legislation of this kind; and not legislation, the sentiment of property.

It must also be inquired whether stealing is natural, and consequently whether there is a special propensity of this kind? Our opponents maintain that such a doctrine is both ridiculous and dangerous: ridiculous, because nature could not have produced any faculty absolutely hurtful to man; dangerous, because it would apologise for what is punished as crime by the laws. To this objection, Gall was accustomed to answer: no one can deny

the facts which prove that theft exists; and as it exists, it was not against the will of the Creator: this propensity is also more or less energetic in different thieves, and there are very few persons who have never stolen any thing: the organ is moreover very considerable in inveterate thieves. I, however, allow that God cannot have created any faculty which is only hurtful to mankind; and this would be the case, if there were an organ of theft,—an organ destined only to theft and robbery. On the other hand it is also certain, that there is no action without faculty and without the assistance of organization. Consequently, theft is grounded upon a certain faculty, and this faculty manifests itself by means of an organ; but theft being an evil action is only an abuse of that faculty. This point is cleared up by analogy. Gluttony and drunkenness are the effect of a certain power, but there is no faculty solely destined to these actions: they are abuses of the special propensity, hunger and thirst. It is the same with adultery and incest, which are abuses of the propensity to physical love. Attack and quarrelsomeness are similarly abuses of the propensity to fight. Hence, we must examine what is the special faculty which produces theft? May it not be the faculty of property and possession? Some thieves take without any intention of keeping what they have stolen; and sometimes men and animals take away things which are entirely useless to them: magpies and ravens, for instance, carry away money and spoons, and gather stones and similar things of which they cannot make use.

Certain thieves also give back, or they are content if the proprietor carries home, what they have taken away. Consequently, the faculty which steals is not essentially the faculty of keeping possession. The faculty in question precedes the possession: it is rather the propensity to take possession. The name possession, therefore, does not characterize this special faculty, which does not care about keeping and preserving.

Gall says that theft is sometimes an exuberance of cunning, and a very great propensity to exercise that faculty. Certain dogs certainly prefer bad bits which they steal, to good dishes which are given to them; and the proverb says, "Stolen morsels are sweet." I am not, however, of the opinion of Gall; for there are thieves who are by no means cunning: and for this reason, Gall was obliged to admit two organs; one of theft and another of cunning. It is also evident that this organ cannot be that of theft, because various persons who have this organ very much developed never steal. Are they therefore destitute of the manifestations of this faculty? To this Gall replies, that he cannot determine whether any person with whom he meets in society, and who has this organ greatly developed, has really stolen; and that he distinguishes only the disposition. But in this manner of speaking, the kind or nature of this faculty remains always the same, *viz*., the disposition to steal.

According to all that I have observed, in comparing animals and man with respect to the func

tions of this faculty, it seems to me, that the special faculty of this organ is the propensity to gather and acquire—to covet, without determining the object to be acquired or the manner of acquiring it. This faculty gives a desire for all that is desirable: money, property, animals, servants, land, cattle, or any thing upon the earth. The faculty produces egotism and selfishness; and persons endowed with it in a very high degree will never forget themselves; but the objects they desire, and their manner of acquiring them, whether by industry, commerce, gaming, or stealing, depend on the influence of all the other faculties. It is in consequence of this faculty also, that we ask "what is this or that object good for?"

This faculty is essentially necessary to man and animals, because their subsistence depends on it. By means of this faculty also, in my opinion, man and animals make provision for the future. The activity of this propensity may indeed be more energetic than is necessary. We have accordingly seen that some species and some individuals of carnivorous animals kill more than is necessary to nourish themselves, and that they delight in killing animals which they do not eat. In the same way, animals and man not only gather what is useful and permitted, but sometimes take away what belongs to others, and that of which they cannot make any use. These latter actions then constitute abuses: and have different names, as usury, plagiarism, fraud, or theft. Thus, after having determined the special faculty

of this organ, and after having explained the possibility of its abuses, it can no longer be said that it is dangerous to admit such an organ.

In this chapter I examine only the special faculties. Their mutual influence forms the subject of future consideration, wherein I shall determine how far every faculty may be active, and where its abuses begin. This organ is situated at the upper part of the temples on the anterior inferior angle of the parietal bone.—(*Pl.* XII. *fig.* 2. VIII.) This and the preceding organ are commonly more developed in men and males than in women and females.

IX. ORGAN OF THE PROPENSITY TO CONCEAL, OR SECRETIVENESS.

Gall calls this organ that of cunning, and he allows that he does not know the sphere of its activity. He ascribes to it cunning, prudence, the *savoir faire*, the capacity of finding means necessary to succeed, hypocrisy, lies, intrigues, dissimulation, duplicity, falsehood; in poets, the talent of finding out interesting plots for romances and dramatic pieces; and finally the slyness of animals. In all individuals remarkable for such actions, a larger developement of this organ is certainly observed. It is situated in the midst of the side of the head above the organ of the propensity to destroy.—(*Pl.* XI. *fig.* 1 & 2. IX.) Gall first observed this organ

in a person who had many debts, but who had the address to conceal his real situation, so that his creditors could have no knowledge of each other. Hence it is evident that Gall observed only the various functions of this faculty, but did not determine the special faculty itself. Hence also he complains in respect to this, as to every organ, that he does not know its sphere of activity. According indeed to his manner of proceeding, it is scarcely possible to determine the sphere of activity of any organ, because the functions of the faculties are infinite. I have mentioned, however, that it is necessary to determine the special faculties without considering the objects upon which, and the manner in which, they act. What is then the special faculty of this organ?

If I consider the faculty of the person in whom this organ was first observed; if I examine the manners of sly animals, and consider what in them is sly; and more especially if I consider the external behaviour of man and animals, when they exercise functions of this kind, it seems to me that the special faculty is the propensity to be clandestine in general, to be secret in thoughts, words, things, or projects. The fox is careful not to be observed; the cat, watching a mouse, moves not a single limb; sly animals in general, if pursued, hide themselves dexterously; a dog conceals his bone; and cunning persons conceal their opinions and intentions, and sometimes manifest an opinion opposite to their own. Hence, the special faculty seems to be the

propensity to conceal without determining the object or the manner of concealing. The uses and abuses of this faculty have these various names; but the propensity to conceal is common to all its manifestations.

Genus II.—*Sentiments.*

After mere propensities follow another kind of faculties which I call sentiments. Several of them are common to man and animals: others are proper to man. I shall first consider the former.

X. ORGAN OF SELF-ESTEEM.

This is one of the faculties which are generally attributed to external circumstances; and no one has thought of an organ on which its manifestations might depend. Sometimes however pride, or a great opinion of their own persons, is observed in individuals who have no influence over others, either by birth, fortune, or personal talents. Gall first found this organ in a beggar: in examining the head of this person, he observed in the midst of the upper posterior part of the head, an elevation which he had not before observed in so high a degree: he asked him the cause of his mendicity; and the beggar accused his pride as the cause of his present state, he having considered himself too important to follow any business: he therefore only spent money, and did not think of earning a livelihood. We have a great number of proofs as to this organ, and can establish its existence. Proud persons and those who, alienated by pride, imagine themselves to be emperors, kings, ministers, generals &c. possess it in a high degree.—(*Pl.* IX. *fig.* 1 & 2. X.)

It appears that certain animals are endowed with this organ, as the turkey-cock, peacock, horse &c. Gall thinks that this organ is the same as that of the faculty which makes certain animals dwell upon mountains, or in general in high regions; and therefore he calls it that of haughtiness, meaning to designate at once physical and móral height. In speaking of the organ of inhabitiveness, I have examined the proofs which Gall admits, and have made observations which differ from his. I separate these two organs from each other, and according to my opinion, one faculty produces the propensity to determinate inhabitation, and another the sentiment of which I now treat.

This faculty gives us a great opinion of our own person—self-love or self-esteem. Its too great activity is the cause of various abuses, as pride, haughtiness, and even of disdain, contempt, presumption, arrogance and insolence; and the want of it, on the contrary, disposes to humility. There are a greater number of mad men than of mad women, who are alienated by pride: and their mimickry is conformable; they speak little, command, and show their importance with gravity.

XI. ORGAN OF LOVE OF APPROBATION.

Persons who are fond of being caressed, honoured and applauded, in short, who are ambitious, have posteriorly the upper and lateral part of the head

greatly developed.—(*Pl.* IX. *fig.* 1 & 2. XI.) Gall calls this the organ of ambition or that of vanity, according to the object. It is called ambition, if the object to which we aspire be of importance, and vanity, if we endeavour to distinguish ourselves by trifles. I consider the activity of this faculty in a more general way. Certain animals are sensible to caresses and flattery; while others are destitute of this sentiment. It is the same with man; for some persons are fond of flattery or of applause; wish to be distinguished and to be honoured; and with this view make use of various means—of dresses, decorations, titles &c. This faculty makes us attentive to the opinion which others have of us, and it loves their approbation in general without determining the object or the manner of acquiring their approbation. It may act on things of the highest importance, on altogether indifferent, or even on hurtful, objects. A coachman endowed with this faculty is pleased if his manner of conducting horses be approved; and a general is elated if he be applauded by his nation for leading an army to victory.

We do not doubt of the existence of this organ; and I call it, according to its special faculty, the organ of approbation. This faculty contributes much, and is indeed essential to society; for it excites the other faculties, and produces emulation and the point of honour. Its activity, when too strong or irregular, causes many abuses; and its want makes us indifferent to the opinions of others. This faculty is more active in women than in men,

and even in certain nations than in others. There is accordingly a greater number of women than of men alienated in this respect. We have met with only one mad man alienated from vanity; but mad women manifest themselves in a manner which indicates evidently that they wish to please: they are affable, civil and courteous.

XII. ORGAN OF CAUTIOUSNESS.

Two persons at Vienna were known to be remarkable for their extreme irresolution; and therefore, one day in a public place, Gall stood behind them and observed their heads. He found them extremely large on the upper posterior part of both sides of the head (*Pl.* IX. *fig.* 2. XII.); and this observation gave the first idea of this organ. The heads of circumspect persons, and of those who want this faculty, are very different. Circumspect animals also, as the stag, roe, pole-cat, otter and mole, and those which place sentinels to warn them of approaching danger, as the chamois, cranes, starlings and bustards, have this cerebral part greatly developed. Geese, cranes &c., have not, indeed, understanding enough to induce us to think, that their habit of placing sentinels is the result of any intellectual combination, but it is possible that this faculty is commanded by nature, by means of some organic arrangement. Moreover, animals which see in day-light, but which do not dare to seek their

food except during the night, have posteriorly the upper and lateral part of their heads more developed than those which go out during the day. The skull of the eagle is different in this respect from that of the horned owl, which sees both in the daytime and at night, because it can contract and dilate the pupil at pleasure. Bats also have the head large posteriorly.

The special faculty of this organ produces precaution, demurs, doubts, places sentinels, and in general exclaims continually, Take care. It considers consequences, and produces all the hesitations expressed by *but*. When too active it causes abuses, as uncertainty, irresolution, unquietness, anxiety, fear, melancholy and hypochondriasis. In treating of the organ of the propensity to fight, I have mentioned that anxiety and fear cannot be the result of the want of courage; but that they must be attributed to some positive sentiment: they result from a too great activity of circumspection. Nevertheless, a person destitute of courage is overcome by cautiousness sooner than a person who feels a great propensity to fight. The want of cautiousness, on the contrary, modifies the actions of the other faculties so far that these act according to their own nature without being restrained by circumspection; and the result is what is called levity or inconsideration.

Thus this faculty is necessary to our preservation, and it is only its too great activity, like that of every other faculty, which causes abuses. A great degree of cautiousness predisposes for instance to

the disease of suicide:—I say, it predisposes to suicide, but it is not the only cause of that crime. In speaking afterwards of the diseased state of the moral sentiments and intellectual faculties, I shall treat of the unfortunate disposition to that crime. This and the preceding organ are commonly more developed in females than in males, probably because they are obliged to exert greater care with reference to their progeny, or in order to supply in them what is wanting as to force.

XIII. ORGAN OF BENEVOLENCE IN MAN, OR OF MEEKNESS IN ANIMALS.

For a long time Gall did not think of placing goodness of heart in the brain. A family at Vienna, however, having often praised the goodness of one of their servants, and told Gall, that he ought to mould his figure in plaster, he at last actually did so, and observed a considerable protuberance on the superior middle part of his forehead. This organ was afterward confirmed by numerous observations; for it is very easy to examine and verify it both in children and in adult persons.—(*Pl.* XI. and *Pl.* XII. *fig.* 1. XIII.) This organ may also be proved by reference to animals, either in comparing different species or different individuals of the same species. Thus several kinds of animal are naturally meek, as the roe, goat, sheep, while others are wild, savage and mischievous: so also some

dogs, horses, cows &c. are meek and familiar, while other individuals of the same kind bite, kick &c. The mild and good-natured animals, then, have the place of their forehead corresponding to the organ of goodness in man elevated and prominent (*Pl.* X. *fig.* 1 & 3. XIII.), while the ill-natured present a hollow.—(*Pl.* X. *fig.* 2 & 4. XIII.)

It is sometimes maintained that mildness is the result of the want of courage; but it is in my opinion a law, that the want of any faculty cannot produce a positive sentiment. On the contrary, it is a fact that many persons are very quarrelsome, and at the same time very good-hearted. In the same way active cruelty cannot be the result of the want of goodness; for cruelty is a positive sentiment. It is indeed true, that goodness or compassion cannot exist in those cruel beings which are fond of tormenting others, but cruelty belongs to the organ of the propensity to destroy, when unrestrained by any other sentiment.

This faculty, although it exists in animals, is greatly magnified and ennobled in man. In the greater number of animals, it is restrained to a passive goodness, but in man its sphere of activity is very considerable. It produces in man goodness of heart, kindness, peacefulness, mildness, benignity, benevolence, complaisance, clemency, mercifulness, compassion, humanity, hospitality, liberality, equity, cordiality, urbanity, in one word, *Christian charity*.

ON THE SENTIMENTS WHICH ARE PROPER TO MANKIND.

Hitherto we have considered man so far as he is animal. All the organs and special faculties I have spoken of are common to man, quadrupeds, birds &c; and in this respect man is even the most perfect of them all: he possesses all those faculties which are more sparingly distributed among different kinds of animals. Besides this prerogative, every faculty is susceptible of many more modifications, and its energy is greater in man than in animals. Moreover, man is endowed with sentiments which constitute the human character, and of which animals are entirely destitute. Till the present time, no system of philosophy has thus clearly indicated the line of demarcation between man and animals. It was for a long time believed that man differs from animals by being endowed with memory, judgment and imagination; but a great number of facts prove that animals possess all these faculties. Others again consider reasoning and religion, as particular attributes of human nature.—I shall here treat only of the sentiments proper to man; and in speaking of the intellectual faculties, I shall also point out which of them are common to animals and man, and which are peculiar to mankind.

XIV. ORGAN OF VENERATION.

In his examination of the actions of man, Dr. Gall visited churches in order to observe the configuration of the heads of those who excelled in devotion. He first observed, that the heads of those who prayed with the greatest fervour were bald: but it is evident that the bald state of the head does not produce devotion; for every bald man is not pious, and though women do not grow bald, yet many of them are devout. Gall, however, observed also, that the heads of these pious men were very elevated:—(*Pl.* XII. *fig.* 1. XIV.) Lavater had made the same observation.

Priests who have chosen this state from natural propensity or vocation, and those who have become priests by the influence of external circumstances or from various other views—religious and irreligious persons, present a very different degree of developement in the middle of the upper part of their heads. The pictures of the Saints present the very same configuration as those pious men whom Gall first observed; and it is also in this respect remarkable, that the head of Christ is always represented as very elevated. Have we the real picture of Christ? Have artists given to the head of Christ a configuration which they have observed in religious persons; or have they composed this figure from some internal inspiration? Has the same sentiment among modern artists given to Christ an elevation of head, which among the ancient conferred a prominence of

the forehead upon Jupiter? At all events the shape of the head of Christ contributes to prove this organization. If the head be very high in the middle line, the hair falls down on both sides, just as this arrangement of the hair is represented in the pictures of Christ.

An objection made to this organ is, that if there be an organ of religion, there is no occasion for revelation. But it is easy to prove that this objection is false: First, there were systems of religion before revelation; Cicero says expressly, that there is no nation, no people, who do not adore a Deity; Plutarch observes, that there is neither town nor village in the world without a God; Aristotle, Plato, and all the ancient philosophers make the same remark; and even the fathers of the church have commented on this truth, in order to prove that the belief in a God is innate. We only add that this manifests itself by a certain organization. Thus the sentiment of religion has existed long before revelation. Besides, all nations have not yet received revelation, and yet these nations manifest religious sentiments. Moreover, as revelation was to be given to mankind was it not necessary to prepare man, or to make him capable of receiving it? Who would endeavour to make any animal inferior to man acquainted with revelation? for it is a general law, that neither man nor animals can be instructed or educated, if the respective faculty be not innate: dogs do not learn religion any more than mathematics. Hence, man must be prepared to receive the former as well as the latter: and on

this account he has received a particular organ of veneration. Revelation then has only regulated the religious sentiments and ideas which previously existed. I think with Bishop Butler,* that "Christianity is a republication of natural religion, and that, which is material, it teaches natural religion in its genuine simplicity."

Thus these considerations prove that the sentiment of religion is inherent in the nature of man, that it is an arrangement of creation, and that mankind never will exist without religion. It may even be maintained, that this organ is not only necessary to mankind, but that it is also the most evident proof of the existence of God. If nature has produced any faculty, there must be an object of that faculty; in the same way as the propensities to love, to destroy &c. exist as well as their objects. The faculty of music exists; and the laws of vibration in external objects are conformable to it. In general every other faculty of man and animals has an object which it may accomplish. Is it then possible that while there is an organ of religion God should not exist? Certainly not.—Hence, God exists.

Gall speaks of this organ under the name of religion, of theosophy, or even of morality: but these expressions are very vague, and far from indicating any special faculty; and they designate a greater sphere of activity than that of this particular organ. I disapprove of the name "theosophy;" for we

* Analogy of Religion, p. 180,

cannot flatter ourselves that we know the nature of God: we can only say what God is according to our conceptions: in other words, all the superior faculties of man, elevated to the highest degree, are attributed to God;—but God may possess many other faculties of which we have not the slightest notion. We can speak only of a Supreme Being, without determining his nature.—I dislike also the name "organ of religion," because that expression has different significations: it sometimes denotes particular acts and ceremonies by which God is venerated; and sometimes it designates also the morality of our actions. We have, however, established as a principle that the organs cannot be named according to any action.—Finally, the name "organ of morality" is still less applicable; for worshipping is only one part of morality. It is also known that one man may be religious without being just, and another may be just without being religious. It remains therefore to be examined, what is the special faculty of this organ. This faculty, then, constitutes a sentiment, and not an idea. Gall accordingly observed this organ first in persons in the act of adoring God: and according to all my observations it seems that its special faculty is the sentiment of veneration, without determining its objects or its manner. It is by this faculty that man adores God, or venerates saints, persons and things. It respects all sacred objects. What indeed can be more natural than to venerate the Being who is considered as the cause of all things? Experience also proves my assertion, that this faculty does not

determine the object to be venerated, nor the manner of venerating. The ancient nations admitted a greater or less number of gods; and, even at the present time, different nations and different persons have different ideas of God, according to their national creeds, and their intellectual faculties; and they venerate him accordingly. We consider this organ as determined. It is situated in the midst of the upper part of the head some way before the crown.

XV. ORGAN OF HOPE.

It seems to me that there is a particular sentiment of hope. Gall considers hope as belonging to every organ; but I think there is a difference between desire or want, and hope. Every faculty, being active, produces desire: therefore even animals desire; and while the respective organ is active, they wish the satisfaction of their desires; but I do not believe that they have the sentiment of hope. I consider this sentiment as proper to man. No other faculty can produce hope or the inclination to believe and to expect; and therefore I admit a particular organ for manifestations of this kind. This sentiment is indeed necessary in almost every situation; it gives hope in the present as well as of a future life. In religion it is called faith. Persons endowed with it in too high a degree are credulous. The organ of hope seems to be situated on the side of that of veneration; but it requires future exami-

nations, before it can be admitted; though I have many observations which support this organ.

XVI. ORGAN OF IDEALITY.

It is a proverb that a poet must be born; and it is also certain that the heads of great poets, though not necessarily of versificators, are enlarged above the temples in an arched direction.—(*Pl.* XVIII. *fig.* 2. XVI.) Now it is impossible that poetry, in general, should be confined to one single organ; and I therefore think that the name organ of poetry, given by Gall to this organ, does not indicate its essential faculty, but that it is necessary to determine what is essential to all kinds of poetry: for this common faculty of all poets then must be the special faculty of this organ, and the combination of this with the other faculties must determine the species of poetry which each poet may produce. It can neither be the faculty of versification, nor that of rhyming; for some authors write in prose, and yet their expressions are really poetical; while others make verses which however contain no poetical thought. Rhyme is still less essential to poetry, for among the ancients it was entirely unknown, and among the moderns poetry is not always rhythmic. It seems to me that in every kind of poetry the sentiments are exalted, the expressions warm, and that there must be rapture, inspiration—what is commonly called imagination or fancy. I observe

moreover, that in all persons this faculty gives a peculiar tinge to all other faculties: it makes them in every thing aspire to ideality. It is a sentiment, and, if I may so speak, the opposite of circumspection: it renders us enthusiasts, while circumspection stops our career by saying, Take care. I call this organ that of Ideality.

I have here to mention certain curious observations without being capable of determining their peculiar nature.—We have observed that if the part of the head, above the organ of ideality and a little backward from it, be very much developed, the persons are disposed to mysticism, to have visions, to see ghosts, demons and phantoms, and to believe in astrology, magic and sorcery. I cannot say whether this is a particular organ, or a greater developement of the organ of hope, or of that of ideality, or of both together.

XVII. ORGAN OF CONSCIENTIOUSNESS.

I think also that there is a particular sentiment of just and unjust, right and wrong, and that a particular organ of justice must be admitted. No animal has this faculty; and its activity is very different in man; some individuals being almost destitute of it, while others possess it in a high degree. It produces only the sentiment of justice without determining what is just; for particular determinations, as to justice, depend on the other faculties with

which this sentiment is combined. A person who combines justice with some propensity of the lower order calls that just, which another person, who possesses justice combined with goodness or veneration, calls unjust.* I shall afterwards give a farther elucidation of the mutual influence of the faculties. This faculty produces the sentiment of duty, and constitutes what is called conscience and remorse.

Gall thinks that there is no organ of conscience; but considers it as the result of the opposition of the dominant character of a person to his particular actions, and, according to him, there are as many consciences as faculties. He even speaks of a good and of a bad conscience: the good conscience being the opposition of the good qualities to a particular action, and the bad conscience being the opposition of the bad faculties to a particular action; in this respect admitting bad faculties. If therefore a good-natured man commit a fault or offend another, he repents, and his conscience torments him, because he has acted in opposition to his natural character. On the other hand, a usurer and a libertine are sorry for having neglected a good opportunity,—the first, of deceiving, the second, of seducing some innocent person. Gall gives to this opposition of the dominant character to any action the name Natural Conscience; and asserts that we cannot trust to the natural conscience, but that it is necessary to esta-

* "All the ways of a man are clean in his own eyes, but the Lord weigheth the spirits." Prov. xvi. 2. "Every way of a man is right in his own eyes, but the Lord pondereth the hearts." Prov. xxi. 2.

blish some positive conscience, that is, to determine what is to be done and what is to be let alone, without considering what any individuals may desire. Therefore it is said, Thou shalt adore one God; thou shalt not kill; thou shalt not steal, &c.

Gall, however, admits that certain inveterate criminals do not feel any repentance, or, what is called by him, good conscience: though he does not deny that criminals, who possess good nature, and have committed some fault, repent sincerely. If, for instance, a mother who has been dishonoured, and consigned to the most unfortunate situation, in a moment of despair and confusion, deprive a new-born child of life; if, the fatal concourse of circumstances being past, and the innate sentiments of mildness and compassion beginning again to act, she feel the contradiction between her natural character and her action, this contradiction constitutes, according to Gall, her repentance or natural conscience. At Spandau, we saw a man who had assassinated his wife in a paroxysm of anger; and this man was unhappy during his whole life. Indeed he was good natured, and generally considered as an honest man. On the other hand, it is beyond doubt that he who is dragged into criminal actions by very strong internal propensities, rarely feels any natural repentance. In such a man the inclinations which lead to evil are energetic. They constitute, if I may so express myself, his principal character; and hence all the actions which result from them are in harmony with his inclinations. This fatal truth may displease those who dream of nothing but of the

dignity of human nature, but it is proved by observation, and it is conformable to Christianity. "A good tree cannot bring forth evil fruit, neither can a corrupt tree bring forth good fruit."* "The natural man receiveth not the things of the Spirit of God, for they are foolishness unto him, neither can he know them, because they are spiritually discerned."† —Cardinal Polignac speaks of men who are born wicked, and to whom crime is delightful. "Why should a criminal," says he, "who does not consider himself as wicked, repent?"‡ Indeed great criminals do not think that they are guilty, and therefore they cannot repent. Examine them according to their juridical processes; follow them to the scaffold and execution! Some of them, with incredible stubbornness, deny the most evident crimes, and sometimes they, with surprising audacity, insult those who bear witness against them: some, with impudent sincerity, relate a series of horrible trespasses and crimes: and some even make the gayest joke of the most outrageous actions, and often, when we shudder with horror at their guilt, they break out into laughter. A soldier had stolen successively from twenty churches; and being conducted to the gallows he hoped to receive pardon: but instead of showing any repentance, he coolly observed to the auditor Wiedemann of Vienna, "I see well there is nothing more to be done here; I shall endeavour to go elsewhere."—Mr. Brugmanns, at Leyden, showed us the skull of the chief of a band of rob-

* Matt. vii. 18. † 1 Cor. ii. 14. ‡ Antilucrece, tom. i. p. 164.

bers, who had precipitated different persons into the canals only in order to have the pleasure of seeing them struggling with death, and who, when on his trial, said, " What will you do with me, am I not an honest man ?"—We have seen a girl who had assisted her mother in killing her father, and who did not manifest the slightest repentance, but if her crime was spoken of, only shrugged up her shoulders. In short, all the juridical proceedings, by which inveterate criminals have been condemned, justify our observation, that certain guilty persons never are guided by conscience. Such men are even proud of the faculties by means of which they deceive, and they recount with pleasure the most remarkable stratagems of their criminal life. Hence, as it is certain that the greatest criminals are not prevented from doing evil by conscience or by repentance, it is necessary that there should be some positive conscience, and that actions should be regulated by rewards and punishments.

I shall now examine whether there is an organ of conscience, or whether conscience consists only in the opposition of the general character to any action. It would appear then that if the assertion of Gall were true, every organ ought to produce repentance whenever any action was in opposition to the natural dominant character of the acting person ; but it does not seem to me that a criminal feels repentance for having done any action which may be good in itself, and not hurtful in respect to the criminal. If a criminal give to the poor a small part of his booty, does he repent having done so ? Certainly not, unless he is betrayed by it. Gall, asserting that

inveterate criminals do not feel any repentance, is in contradiction with himself. Besides, in saying that usurers repent of having neglected a good opportunity of deceiving others, Gall confounds repentance or remorse with the being sorry for or being displeased. It seems to me that he commits a fault similar to that of those who confound inclination or propensity with will; for though every cerebral organ manifests a desire, a propensity, yet every organ does not produce will. In the same way every organ, not being satisfied, or being disagreeably affected, produces pain, or sorrow; but every organ does not produce repentance or remorse. I shall afterward speak in detail of the difference between inclination and will; for I here mention it only on account of analogy. Thus I maintain that no sentiment common to animals and man produces repentance.

It may be asked, whether repentance be the same as will? The answer must be negative; for will is the effect of the understanding, while repentance or remorse is the effect of the mind in the signification I have adopted. The latter is a sentiment independent of understanding, nor is there any proportion between conscience and understanding. I am of opinion that repentance, remorse, or conscience, must be attributed only to the faculty of justice and duty. In conformity with the preceding considerations, I also disapprove of the division of the conscience made by Gall into natural—good or bad, and artificial or positive. I divide it, 1st, into *natural* or *absolute* conscience, which is the effect of

justice combined with all the other faculties proper to mankind, while all the faculties common to man and animals are held in subordination. 2d, Individual, particular, or relative conscience, which results from the justice of every one combined with his other faculties. 3d, Into positive conscience, which is fixed by legislation, whether divine or civil, as by the commands, Thou shalt not eat meat on Fridays or Saturdays; thou shalt go to church every Sunday, &c. Thus I admit a particular organ of justice, and it seems probable that it is situated on the sides of the following organ.

XVIII. ORGAN OF FIRMNESS.

Dr. Gall observed that persons of a firm and constant character have the top of the brain much developed.—(*Pl.* IX. and *Pl.* XII. *fig.* 2. XVIII.) Lavater had distinguished the same configuration in persons of an immoveable character. The special faculty of this organ is difficult to be determined; and its effects are often called will; but this will is not the moral will which is necessary to liberty. It is true, that persons endowed with a greater developement of this organ say commonly, "I will," in the same sense as the words, I want, I desire, I insist, I command; but, it is obvious that they then apply the word without any strict reference to the acts of volition. This faculty contributes to maintain the activity of the other faculties, by giving

constancy and perseverance. Its too great activity produces infatuation, stubbornness, obstinacy and disobedience; and its want renders men unsure, inconstant and changeable in conformity with other impressions. We are convinced of the existence of this organ by a multitude of observations; and it seems to be situated in the midst of the feelings, in order to strengthen their activity.

ORDER II.—Intellect.

Genus I.—*Knowing Faculties.*

Having finished the first order of faculties—the propensities and sentiments, I shall now consider the second. The first genus of this order contains those faculties by means of which we know the existence of external bodies and their qualities. Strictly speaking, the five external senses belong, in some measure, to this genus of faculties. I have, however, already treated of the knowledge which man and animals acquire by their assistance; and I shall now examine the organs necessary to acquire certain kinds of knowledge which the five external senses cannot produce.

The knowing faculties may farther be divided into two sections.—Several make us acquainted with every individual object and its physical qualities; and others consider the different relations of various objects. The first conception which our understanding must have of external beings is no doubt that of their existence; and in order to acquire this conception, the external senses are not sufficient, although without an impression on them this conception cannot be determinate. Thus the organ which procures knowledge of external beings must be considered as the first in respect to the order in which the faculties operate.

XIX. ORGAN OF INDIVIDUALITY.

Dr. Gall observed, in society, different persons who though not always profound were learned, had a superficial knowledge of all the arts and sciences, and knew enough to be capable of speaking on them with facility—such men as are deemed brilliant in society. He found that in them the middle of the lower part of the forehead was very prominent, and consequently that the anterior inferior part of the brain was much developed.—(*Pl.* XIII. *fig.* 1. XIX.) At first, Gall called this organ that of the memory of things, because the persons endowed with a great developement of this organ had much information, or knew many things; but afterwards, as he observed that memory is only a degree of the activity of every faculty, he named it the organ of the sense of things. In comparing animals with man, and one kind of animal with another, it is obvious that tame animals have the forehead more developed than wild ones, and that they are more or less tameable in proportion as the forehead is developed; and therefore Gall now calls this organ that of educability.

The cause of the tameableness of animals has long been sought; and it has been asked, whether animals are tamed by nature, or whether they are subdued and subjected to our services by means of our understanding? It was for a long time believed, and indeed many physiologists and philosophers still think, that the tameableness of animals is solely the work of man. But this opinion is erroneous:

otherwise why should it be at present impossible for man to tame the other wild species of animals? Yet we are now better acquainted with the manners of animals than two thousand years ago, and consequently we can better adapt to them external circumstances. It is indeed possible to tame individual wild animals, for instance, one chamois, one tiger &c. but never the whole race. The hunting tigers, of Tippoo Saib, which were brought to the Tower of London after the fall of Seringapatam, had been tamed for the cruel purpose of the chase; but they seemed to be tame only to their Indian keeper and to persons whom they had been accustomed to; were with difficulty retained so; and ultimately became savage. The young of wild animals are always wild and fly into solitude. On the other hand, certain animals are tame without our wishing it; and thus mice every where follow the abodes of man; and dogs, in Egypt, though considered as impure animals, and without a particular master, yet remain in the villages and towns, never go far from the dwellings of man, and consequently are originally tame.

In order to demonstrate this organ, Dr. Gall, in his lectures, shows a scale of animals, and proves that they are more tameable in proportion to the height of their forehead. This organ, however, does not fill up the whole of the forehead. Meekness moreover certainly contributes much to the tameableness of animals; and Gall himself, in speaking of the organ of meekness, says, that animals endowed with the organ of that faculty are more

docile and more serviceable than others. Besides, the reflecting faculties of animals on all of which tameableness must depend, are naturally connected with this organ of facts. I think therefore that the faculties of the whole forehead contribute to the tameableness or educability of animals; that Gall's observations relative to this special organ are not sufficiently precise; and that his manner of comparing this organ in man and animals is very inaccurate. I am confirmed in my opinion not only because Gall, in comparing this organ, compares the whole foreheads of man and animals, but also because he compares the same foreheads in yet other respects.

In looking for the special faculties, and their respective organs, I cannot make use of such general comparisons, striking though they are as a whole, and showing that the developement of the forehead coincides with the degree of the understanding. In animals of lower kinds, the brain, instead of ascending and forming a forehead, is even inclined downward. By degrees it becomes horizontal, is elevated, and then forms a forehead less or more developed: finally, in man it presents the most developed forehead; still, however, being sometimes in various degrees vertical, and sometimes even prominent. Notwithstanding these remarks, I admit that animals are endowed with this organ; and they consequently recollect what has happened to them. An old fox which has escaped several snares, and which knows that it is watched, takes more precau-

tion, and proceeds with greater slyness, when it approaches houses, in order to catch poultry. Any bird whose nest has been destroyed, in a frequented place, conceives the necessity of in future placing it in solitude; the construction of its second nest is also more perfect. A dog resists its instinct to run after a hare, because it recollects the beating which on that account it formerly received. Similar facts might be infinitely multiplied; and it is consequently evident that the actions of animals are not subjected to an absolute necessity, but that animals are, in a certain degree, susceptible of education, partly by the organ in question, and generally by the faculties situated in the whole of the forehead.

From what I have said, it already results that the name educability is bad. Besides, every faculty may be educated, that is, exercised or directed. What is then the special faculty of this organ, and what its sphere of activity?—Persons endowed with this faculty in a high degree are attentive to all that happens around them, to every object, to every phenomenon, to every fact; and hence also to motions. This faculty neither learns the qualities of objects, nor the details of facts; it knows only their existence: the qualities of the objects, and the particularities of the phenomena, are known by the assistance of other organs. This faculty moreover has knowledge of all internal faculties, and acts upon them. It desires to know all by experience, and consequently it puts every other organ in action; it wishes to hear, see, smell, taste and

touch, and to know all the arts and sciences; it is fond of instruction, collects facts, and leads to practical knowledge.

I call this faculty that of *Individuality*, because it knows not only the external world in general, but also each object in its individual capacity. This organ is early developed in children, because they are obliged to acquire knowledge of the external world. By this faculty, children are attentive to every object and fact, and in a short time make an immense number of observations. We consider this organ as proved by facts. Its place is already indicated.

XX. ORGAN OF FORM.

Dr. Gall sometimes speaks of an organ of the knowledge of persons. Being desired to examine the head of a young girl who had an extreme facility of distinguishing and recollecting persons, he only found in her the eyes pushed laterally outward, and a certain squinting look. My manner of considering this faculty is the following:—The preceding faculty takes cognizance of the existence of external bodies; and the first quality, which our intellect considers in them, is their form, while at the same time persons are particularly known by their form. I therefore reduce this faculty to the general consideration of form. Persons, endowed with it in a high degree, are fond of seeing pictures, and if they make collections, they collect portraits. Crystallography is the result of this faculty; and it

seems to me that the conception also of the smoothness and roughness of bodies belongs to it. It is certain that vision and touch are not sufficient to make us acquainted with these qualities of bodies; they furnish only the impressions, while an internal faculty forms these conceptions. There is also no proportion between this faculty and the perfection of these two external senses.

Animals of the lower order, as insects, know well individuals of their kind and of their family; and therefore they possess the faculty in question. Honey-bees distinguish the individuals of their own hive from those of any other: in a flock of sheep, the young ones know their mother: and elephants and dogs give very striking examples of this kind, by recognizing persons after having seen them a long time before. The organ of form seems to be placed in the internal angle of the orbit; and if this part of the brain be much developed, it pushes the eyeball toward the external angle, that is, a little outward and downward.—(*Pl.* XIII. *fig.* 2. XX.) According to the external configuration of the heads of Chinese whom I have seen in London, it seems to me, that this part of the brain is greatly developed in them. This organ, in order to be verified, still requires many observations.

After the existence and figure of any body, the mind considers its dimensions or size. There is

certainly no proportion either of the senses of feeling or seeing, or of the other internal faculties, to this kind of conceptions. Sight and feeling are not sufficient to conceive the various sizes and their relations any more than hearing is to receive the harmony of sounds, or sight the relations of colours. The faculty of distinguishing form also differs from the faculty of size, because there is an essential difference between the idea of size and that of form: the form may be the same and the size quite different, or the size the same and the form very different: moreover, one of these kinds of knowledge may exist without the other; and there is no proportion between them. Nevertheless these two organs seem to be near to each other, though not the same.

In treating of the sense of feeling and of its sphere of activity, I have ascertained that the ideas of weight and resistance, of consistency, density, softness and hardness, cannot be attributed to this external sense. Though previous impressions take place on the muscles, yet these peculiar conceptions are the results of an internal operation of the mind; and we must, therefore, admit a particular faculty for them. Its organ also must be situated in the neighbourhood of the organ of form and size. I grant that this is only conjectural, but from the general proofs of the plurality of the organs, I am convinced, that these operations of the mind depend

on a peculiar cerebral part, though I cannot yet absolutely determine it. The conceptions of form, size, weight and colour are certainly as different as the various feelings of which I have spoken.

XXIII. ORGAN OF COLOURING.

The qualities of external bodies, which I have examined, are those which are most essential to them; and the knowledge of these qualities is also more important to man and animals than the faculty which makes us acquainted with colour. In speaking of vision, however, I have shown that vision is insufficient to bestow excellence in colouring among painters. It is true the eyes perceive the beams of light, and are affected agreeably or disagreeably by the different modifications of light or by colours; but they do not conceive the relations of different colours—their harmony or discord, and they have no memory of them. In order to prove this assertion, we need only compare, in animals and man, the faculty of perceiving light or vision with the faculty of conceiving colours. I am not indeed certain that animals are destitute of the faculty of distinguishing colour, though they have no art of painting; for there is a great difference between producing a thing, and being capable of perceiving it. Animals have the senses of smell and taste, but they cannot produce the enjoyments of these senses; and in the same way it is possible that they perceive

different colours, and their harmony or discord, without being capable of painting.

Certain persons are almost destitute of the power of perceiving colours: we know a family of which all the individuals distinguish only black and white; Dr. Unzer, of Altona, could not perceive green and blue; and a boy, of Vienna, who wished to become a tailor, was obliged to abandon this trade because he could not distinguish different colours: there are many similar examples. Those persons, who do not perceive colours, have sometimes the sense of vision very acute, and readily perceive the other qualities of external bodies, as their size and form. Indeed the faculty of perceiving the harmony of colours is totally distinct from that of form: for there is nothing more common than that a painter should be an admirable draughtsman and a vile colourist. Thus, as in man the faculty of colouring is not in proportion to the sense of sight, nor to the understanding in general, it seems evident that there is some particular faculty which perceives different colours, recollects them, and judges of their relations. This faculty is necessary to painters, dyers, enamellers, and to all those who are occupied with colours and their shades. It is by means of this faculty that certain persons are so much charmed with flower gardens, or with enamelled meadows, and with a tasteful choice of colours in dress and in furniture. Its organ is placed in the midst of the arch of the eyebrows. The external sign of a greater developement of the organ of this faculty is a vaulted and round arch of the eyebrows.

—(*Pl.* XIV. *fig.* 1. XXIII.) This configuration gives to the face a look of gaiety and pleasure. In the Chinese, the orbitary arch is elevated in the middle, while the eyes are depressed, and it is well known that they are fond of colouring. This faculty is generally more active in women than in men; they are more fond of colours than men are; and they exhibit this taste in their dresses. Some women even acquire a certain perfection in colouring, while in all other parts of the arts they are surpassed by men. Their eyebrows, accordingly, are more arched than those of men.

In this as in other faculties, it is necessary to distinguish the quality from the degree of activity of the faculty. There are individuals and nations who are fond of colours, but who do not feel their harmony or discord, that is, have no judgment or taste respecting them. This idea will be understood from the consideration of judgment in general.

XXIV. ORGAN OF LOCALITY.

It happened that, though Dr. Gall had always good eyes, he could not again discover places where he had been before. On the contrary, one of his fellow-students, called Scheidler, had a surprising facility of recollecting localities and particular places, and never, for instance, lost any place where he had discovered a bird's nest, but always found it again without having made any artificial marks. Gall,

however, could not find the places again, although he had been very attentive and had had recourse to artificial indications. As, then, Gall formed various busts in plaster, he moulded also that of his fellow student Scheidler, known to him by his excellent local memory; and he distinguished at the eyebrows, toward the mesial line of the head, a protuberance on each side which reached to the middle of the forehead. Observing afterwards every person endowed with a greater degree of this faculty, he one day met, at Vienna, a woman who had this organ so extremely developed, that her face was deformed by it; and, on speaking to her, he learned that she had the greatest propensity to travel, that she had left her parents, at Munich, solely in order to see foreign countries, that she never lived long in the same house, because she liked change of place, and that her greatest pleasure consisted in travelling.

The pictures and busts of great astronomers, navigators and geographers, as of Newton, Columbus &c., present a great developement of this organ. —(*Pl.* XIV. *fig.* 2. XXIV.) This faculty caused Columbus to seek for a new continent, and it excites every zealous traveller. Bloede, of Dresden, speaks of one who had formerly been a miner, known under the name of Augustus of Schneeberg, because he was born in that town, who with a kind of ridiculous eagerness which prevents him from staying longer than one or two days at the same place, runs every year over the greatest part of Saxony, Lusatia and Silesia: he has every day, like migrating

birds, a fixed station, and brings to every landlord, who gives him relief, compliments and salutations from all his friends; and he, then, tells all the details of his last journey, and speaks with the greatest volubility, keeping, meanwhile, his body immoveable and his eyes shut: Bloede states, that this odd person has really two large protuberances corresponding to those of this organ. At Torgau, in Saxony, we saw a blind man in whom this organ was much developed, and who told us that he was fond of hearing geography and travels spoken of, and that he had often dreamed of foreign countries, though he had never seen them. In one word, this organ has, in man, been proved by many thousand facts, and we have no doubt of its existence.

Animals also must be endowed with this faculty. Without it they could find neither their progeny nor their dwellings, after they had been obliged to leave them in order to seek for food. This faculty is indeed very active in certain animals, while others are almost destitute of it; and this difference is not only perceptible in different kinds of animals, but also in different individuals of the same kind. One dog, having scarcely gone down stairs, loses the door of its dwelling, while another finds its usual abode and master from an enormous distance. Thus a dog was transported in a carriage from Vienna to Petersburg, and after six months it returned to Vienna: another dog was transported from Vienna to London, and found means to come back, by attaching himself to a traveller in the packet boat, and going with him to Mentz, whence he himself

returned to Vienna: another was carried from Lyons to Marseilles, where he was embarked and conducted to Naples, but came back to Lyons by land: another found again his former master in Suabia, after having left his new master in Hungary &c. Similar facts prove that those persons are wrong who derive this faculty from the sense of smell; for none of the dogs here mentioned could discover any trace by smell: besides, dogs do not always return the nearest way, but sometimes make extraordinary turnings. Certainly it is not the sense of smell which leads back pigeons though transported to the distance of twenty leagues or more, confined in a sack, and prevented from seeing the country. Such too is the case with the falcon of Iceland, though it has been carefully confined: often the first time it is sent against a heron, it ascends vertically into the air, distinguishes its regions, and takes the direction of the north. It is equally impossible to maintain that this faculty is an attribute of the eyes, because there is no proportion between the energy of this faculty and that of vision. Hence it must be attributed to some internal organization.

This faculty being innate, and being rendered active by internal excitement, explains a phenomenon observed in many animals. Certain animals, chiefly birds, as swallows, storks, starlings, quails, nightingales &c., migrate at certain periods of the year. These animals also come back, not only into the same climate and into the same country, but to the same place—to the same window, bush, chim-

ney, or tree. These migrations do not result from want of food alone; for though it is true that the faculties are excited by external wants, and that certain birds leave one country in order to seek food elsewhere, yet the faculties must exist before they can be excited. Besides, every faculty may be active without being excited by an external want: and this is rendered evident by the circumstance that certain birds migrate before food is wanting, and come back before food is to be found. Moreover, though such birds be confined to a cage, and fed abundantly, they become unquiet at the periods of migration. It may lastly be asked, why do not all birds leave their ordinary dwelling when food is wanting? Hence it is necessary to admit an internal and innate faculty which produces all these phenomena.

It remains to be determined what is the special faculty of this organ, and the sphere of its activity? This faculty measures distance, and gives notions of perspective: it makes the traveller, geographer and landscape-painter; it recollects localities and judges of symmetry. Hence it seems to me that it is the faculty of locality in general. As soon as we have the conception of the existence of any body and its qualities, it is necessary that it should occupy a place. This faculty, then, conceives the places occupied by external bodies; and it makes space not only known to us, but it is also fond of this kind of knowledge, and explains all the phenomena of which I have spoken. Locality cannot be the same as size, because the conception of size

concerns individual objects themselves: but it is quite another sort of conception which considers the various situations or localities wherein individual objects are placed with relation to each other.

It does not seem to me that space is a mere form of our understanding, as Kant has maintained. It is true the conception of space cannot be attributed to the five external senses; but space certainly does exist in the external world. The conception of causality also cannot be attributed to the five external senses; but the relations and succession of phenomena, called cause and effect, exist in nature. The same truth applies to all the categories established by Kant relative to external objects: internal faculties constitute them, and they are adapted to external bodies, or, in other words, all our conceptions of external objects are the result of internal faculties which are, by creation, calculated to apply to the external world.

It seems to me that there is also a particular faculty which enables us to conceive order. We may have some idea of different objects without order; yet the mind, though acquainted with external objects, their qualities, and the places they occupy, has still to consider the order in which they are ranged with regard to each other. There are individuals who, in their rooms, like every article of furniture, and at table every dish, in its place, and who are displeased with any irregular arrangement of them. The Sauvage de l'Aveyron at Paris, though

an idiot in a very high degree, cannot bear to see a chair or any other object in disorder; and as soon as any thing is deranged, he, without being in any way excited to it, directly puts it in its proper place. This sort of arrangement, however, is different from that philosophical method which is the result of its consistency of ideas. The faculty, of which I here speak, gives method and order in arranging objects as they are physically related; but philosophical or logical inferences, the conception of systematising or generalising, and the idea of classification, are formed by the reflecting faculties. This faculty is merely fond of putting the particulars in order according to physical considerations: as in a library, books may be arranged according to their size and form, and in natural history animals may be classed according to their various configurations. In general, order may be applied to various other faculties —to form, size, weight, colour, things, &c. Its organ is probably situated outward, but not far from the organs of size and locality. Is cleanliness or tidiness dependant on the same faculty as order?—Does it produce also the pleasure of seeing any thing complete, because order is impossible while the object, as a collection, is incomplete; whatever may be objected to it, this sort of conceptions is different from all the preceding ones. The organ is not indeed certain; but it must be looked for.

In the same manner, the faculty of time seems to be quite distinct from any other: it may even exist

without order and number. Yesterday, to-day, to-morrow, the day after to-morrow &c., constitute a succession without any regard to the number of days. There is more connexion between order and number than between time and number, and there is more connexion between time and order than between time and number. Order is more in relation to objects, and time to facts or events. The conception of time seems to be higher in the scale, and its organ accordingly occupies a higher place in the brain; the organ of order holds the middle place; and that of number, the lowest and most external. Our natural expression of time and number proves indeed that the organs of these faculties occupy different places, and that the seat of the organ of the former is higher than that of the latter; in thinking of time we raise up the eyes, and in ciphering we look downward and outward.—I shall afterwards speak of a faculty which examines the relations between cause and effect. This faculty supposes a succession of phenomena, and cannot, in place, be far from the proper organ of succession or of time. It seems indeed that the organ of time is situated between the organs of individuality, space, order, tune and cause.

XXVII. ORGAN OF NUMBER.

Some individuals remarkable for their great talent of calculating excited the attention of Dr. Gall. He found even children who excelled in this faculty.

Thus a child of seven years of age, called Davaux, was extremely delighted with running about the fairs and making calculations for the merchants: a boy of thirteen years of age, born at St. Poelten, not far from Vienna, in this respect excelled his school-fellows surprisingly; he learnt easily an immense quantity of numbers, made the most complicated arithmetical operations from memory, and very soon found their result: Mr. Mantelli, a counsellor of the Court of Appeals at Vienna, took a particular pleasure in the solution of arithmetical problems; and his son of five years of age did nothing but calculate during the whole of the day. In such individuals the arch of the eye-brows is much pressed downward or elevated at the external angle of the orbit.—(*Pl.* XV. *fig*. 1. XXVII.) This sign is the result of a greater developement of the part of the brain situated behind this place. The portraits and busts of great calculators present the external sign of this faculty, as Newton, Euler, Kaestner, Jedidiah Buxton &c.—(*Pl.* XV. *fig*. 1. XXVII.) We have made an infinity of observations upon this organ; and we consider it as demonstrated.

Certain races of negroes make five the basis of their enumeration, that is, they count only as far as five by simple terms, whereas we Europeans proceed as far as ten: all their numbers after five are compound, whereas ours are not compound till we have passed the number ten; or, while our terms, six, seven &c. are simple, they terminate their simple numbers at five, and say five-one, five-two, five-three &c.—Negroes in general do not excel in this

faculty. Accordingly the heads of negroes are very narrow at the place of this organization. However, in certain individuals among them, the faculty of reckoning is considerable, and more energetic than in many Europeans.

I am not certain whether this faculty exists in animals. It is said that a bitch perceives if one of her puppies be taken away; but it is not evident that she counts her young ones: she may perceive by the faculties of individuality and form, that this individual is wanting. George le Roi has observed, that magpies count three; for if there be a hut in the neighbourhood of a tree, upon which a magpie has placed its nest, and if three persons enter this hut, the magpie is not deceived—it does not come to its nest, before the three persons have left the hut; but if more than three persons enter, it can no longer reckon their number, and cannot compare the number of those who are gone in, with that of those who are gone out. Dupont de Nemours, however, thinks that magpies can count nine.

What is the special faculty of this organ, and its sphere of activity? Whatever concerns unity and plurality—number—seems to belong to this faculty. Hence, its object is calculation in general. Gall often calls this organ that of mathematics, but I think that this faculty only calculates: therefore arithmetic, algebra and logarithms belong to it; but the other branches of mathematics, as geometry, &c. are not the mere results of this faculty, which, however, may be applied to different faculties as to form, size, colour &c.

XXVIII. ORGAN OF TUNE.

It is with the organ of tune in respect to the ears, as with the organ of colour in respect to the eyes. The ear hears sounds, and it is agreeably or disagreeably affected by them; but the ear has no recollection of tones, nor does it judge of their relations: it does not perceive the harmonies of sound, but only separate sounds; and sounds, as well as colours, may be separately pleasing, though disagreeable in combination. In treating of the sense of hearing, I have already demonstrated, that on the ear the origin of music does not depend. Besides the above-mentioned proofs that the ear is not the organ of musical perception, there exists a direct proof that an internal organ is necessary to the manifestations of this faculty; for sometimes in epileptic fits, in delirium, and syncope, certain individuals sing continually and with great precision; and then this faculty is alone active while the functions of all the other faculties are deranged. A greater developement of this organ enlarges the lateral parts of the forehead (*Pl.* XV. *fig.* 2. XXVIII.); but its form varies according to the direction and form of the convolutions. In Gluck, Haydn and others, this organ had a pyramidal form; in Mozart, Viotti, Zumsteg, Dussek, Crescentini and others, the external corners of the forehead are enlarged but rounded.

The heads and skulls of birds which sing, and of those which do not sing, and the heads of the different individuals of the same kind which have a

greater or less disposition to sing, present a conspicuous difference at the place of this organ. The heads of males, for instance, and those of females of the same kind of singing-birds, are easily distinguished by its different developement. In short, we consider this organ as established by the immense number of observations which prove its existence.

There is a striking analogy between colours and tones, and their respective organs. Colours being perceived by the eyes, and sounds by the ears; there are primitive colours, and such also is the case with tones. There is an agreeable succession of colours, as there is of tones; that is, there are colours and tones which agree with one another, and others which do not. Colours may harmonize, and tones may be concordant. Lastly, the concordance both of colours and of tones may be considered by the faculties of order and number. In this manner indeed, colours and tones are calculated, and thus are the principles of painting and music established.

XXIX. ORGAN OF LANGUAGE.

I have already mentioned the observation of Dr. Gall, that in his youth he had reason to be vexed that while several of his school-fellows learnt by heart even things which they did not understand with great facility, he had the utmost difficulty in engraving in his memory a less number of words;

and also that in those individuals who had so great a facility of learning by heart, he afterwards observed the eyes to be very prominent. He accordingly established an organ of words, the greater degree of developement of which is denoted by the prominence of the eyes. Sometimes, then, the eyes are not only prominent (*Pl.* XVI. *fig.* 1. XXIX.), but also depressed downward, so that the under eye-lid presents a sort of roll, or appears swollen; and (*Pl.* XVI. *fig.* 2. XXIX.) such persons are fond of philology, that is, they like to study the spirit of different languages. Gall speaks of these two configurations as of two different organs under the names, an organ of words, and an organ of languages.

It is indeed true that some persons learn easily the spirit of different languages without having a great memory of words, and that other persons easily acquire words without knowing the spirit of any language; yet it seems to me, that the memory of particular words, and philology in general, are grounded upon the same special faculty. I shall afterwards show that the judgment and memory of any faculty are not different degrees of activity, but that judgment is only a mode of activity, and that it may exist without great memory of the respective faculty. It seems also to me, that the organ of words must have its laws, as well as the organ of colour, tune, or any other faculty; and these laws of words constitute the spirit of language. I am satisfied of the truth of this opinion, because the spirit of all languages is essentially the same, just as the spirit

of all kinds of music. The laws or principles of music, painting and language, are constant and every where the same; and they are only modified in different nations according to modifications in the structure of the organs, and to the combinations of these faculties with others. I therefore admit only one organ of language.

Before it is possible to understand the special faculty of this organ, it is necessary to examine the question so often treated by different authors, *viz.* what is the influence of signs upon ideas? According to many philosophers and to the most common opinion, signs may produce ideas. I think however with St. Martin, that it is more reasonable to put the opposite question: what is the influence of ideas upon signs? yet the Institute of France has given the prize to him who developed the influence of signs upon ideas. In speaking of the influence of signs upon ideas or *vice versâ*, the question ought to be more distinctly stated; and it should be determined whether artificial signs can *produce* ideas. I do not think so; but on the contrary am convinced that no arbitrary sign can *produce* any idea; that ideas precede, and arbitrary signs follow; that without ideas there would not be any arbitrary sign; and that without having first had the idea, the arbitrary sign has no signification. We have an evident proof of this in persons blind from birth; for in them the words red, green &c. do not produce any conception of colour.

Here, I must explain what an idea is. Some philosophers call idea, according to the etymology of

the word, any sensation which presents an image. In this sense however there are very few ideas; and even the sensations of the five external senses would not all deserve this name; for savours, odours, tones, and colours, do not represent any image. Other philosophers call idea every sensation produced by means of the five external senses. Others again understand by this expression every sensation produced both by external and internal impressions. Moreover, they speak of ideas as being of two kinds, simple and compound; the first kind as acquired by the external senses; the second as the result of reflection, *viz.* abstract and general ideas. I propose to call *ideas* the conceptions only of the knowing faculties, and to call *reflection* every function of those faculties which compare, and of which I shall afterwards speak. Now the internal faculties may be active by means of the organic apparatus; and a being may have an inclination, a sentiment, an idea, or reflection, without manifesting them by any sign whatever. Man and animals, however, are destined for society; it is consequently necessary they should communicate and understand their sensations, ideas and reflections; and this communication can take place only by signs.

These signs are either natural, or arbitrary and artificial. The natural signs are conformable to every faculty. All beings endowed with the same faculty manifest its activity essentially in the same manner, and all beings endowed with the same faculty understand its natural manifestations: but several beings, all endowed with different faculties,

could not communicate their sensations. This law is common to man and animals. Animals, which have a certain faculty in common with man, understand his natural manifestations. The dog, for instance, perfectly understands the signs of anger in his master, because the dog possesses the faculty which produces anger; but the dog will never understand the natural signs of the adoration of God. Hence, it is also obvious that individuals of the same kind understand these natural signs better, if their respective faculties are of equal strength.

This natural language is also known under the name of pathognomy; and under that head I shall afterwards treat of it with more detail. Here I need only mention in general, that every faculty, being active, involuntarily produces particular signs, which form the natural language common to man and animals in as far as their faculties are common. It is true that these natural signs produce the respective feelings: and on this account their influence is of great importance in teaching the deaf and dumb; for by means of this natural language they may become acquainted with the expressions of the various internal affections. It is, however, to be observed, that the natural signs communicate principally the propensities and sentiments, and in a less degree the different conceptions and reflections of the understanding. Natural signs indicate the activity of the different intellectual faculties, but not their determinate actions: these are indicated by the second sort of signs, which, however, are not

understood before man and animals have had the relative determinate ideas.

The second sort of signs are arbitrary or artificial. I have mentioned that natural language is common to animals and man: artificial language is a prerogative of mankind. This language is the result of the superior intellectual faculties, which contrive and procure the enjoyments of all the other faculties, and of which I shall afterwards treat. In order to communicate his sensations and ideas to others, man makes more use of the artificial language than of the natural, though natural language always and involuntarily accompanies the artificial. As the natural language is expressed principally by voice and muscular motion, so these parts present the most natural and most convenient means of artificial signs. Of these the voice is the most commodious; but if these means cannot be conveniently used, as in addressing the deaf, or persons at a distance or absent, we have recourse to other means, as to gestures for the deaf, and to those in sight, but not within hearing, and to written signs for persons who are absent. How little the artificial vocal signs are understood, is evident from different languages. If, moreover, we wish to communicate certain sensations or ideas to any other person, and to him alone, we are obliged to choose arbitrary and secret signs—signs which he alone understands. Hence it is evident that artificial signs do not of themselves produce any idea, but that they do so only in consequence of an arbitrary agreement.

Now the superior intellectual faculties form the conception of producing artificial signs; and therefore the sensations, ideas and reflections must exist, before arbitrary signs can be invented in order to indicate them. It follows, moreover, that signs are multiplied and modified according to the sensations and conceptions of the mind; and hence there are as many sorts of signs as there are different faculties. There are words or signs to indicate individual objects, that is, nouns and verbs. Other words denote the qualities of the substantives; and in certain languages these adjectives are concordant to the substantives; and are susceptible of different degrees. As there is a difference between the sexes in living beings, the signs indicate also this difference, and admit of genders. The number of objects is also considered :—sometimes the number alone, sometimes number combined with order, and sometimes with order and time—as one, two, three; or first, second, third; or first time, second time, third time. There are other words again which may be substituted for substantives, whether persons or other objects, namely, pronouns, which are either personal, possessive, demonstrative or relative. Other signs denote any state of the subject spoken of, which may be a person or a thing, and its state may be active, passive, or neuter. This state may be affirmed or denied by certain terms in a positive (indicative); conditional (conjunctive or subjunctive); or imperative manner. This state may be, moreover, considered in respect to time—whether it exist at present, or whether it be past, or whether

it will take place at a future period. These words denoting the state of the subject are called verbs. There are yet other signs which explain the verbs:—a great number of them, being analagous to those which indicate the qualities of the substantives, denote places, times, numbers, quantities &c. There are also particles which indicate the different operations of the mind: some particles denote any cause; some, any connexion or conjunction; others, any condition; and others again, any time, any order, any sudden emotion of the mind, (interjections). Thus there are artificial signs for all the operations of the mind: and if all signs were reduced, in respect to etymology, to nouns and verbs, their significations would still be different, and on this account it is that their terminations have been changed.

Now there is some particular faculty which learns all these particular signs produced by the superior intellectual faculties, in conformity with the activity of all the faculties. This faculty which learns the arbitrary signs is quite different from those which produce them; and also from those which produce the sensations and ideas. There is indeed no proportion between these different faculties. Animals do not at all produce, yet they learn, the significations of arbitrary signs, in as far as they are endowed with the respective sensations and ideas: hence tame animals learn in every country the arbitrary language of their masters: they may acquire even the significations of different sounds in different languages. Some persons excel in one kind and

not in another of these faculties. It is also possible to have many ideas without possessing the faculty of learning the arbitrary signs which express them, and to know many words without having many ideas. Thus, by this faculty we perceive the connexion of any sign, audible or visible, with the thing signified; by it we understand the meaning represented in Algebra by different symbols; and by it the signs by which the deaf and dumb express themselves are learnt.

Finally, in order to speak by audible signs, besides the inclinations, sentiments, ideas, or reflections, and the invention of words or vocal signs which express them, we must possess the organs of voice, and the sense of hearing. I have already stated that arbitrary language is more necessary to the manifestations of the intellectual faculties than to those of the propensities and sentiments. The organ of language accordingly seems to be placed in the midst of the knowing faculties, where it occupies a transverse situation.—(*Pl.* I. *fig.* 1. XXIX.)

It appears that, as is the case with other organs, this one is composed of different parts. Accordingly some persons easily forget proper names, while they recollect those words which denote the qualities of external bodies. Other persons lose, by disease, the memory of proper names, while they preserve the memory of words indicating the qualities of objects. One Lercard, of Marseilles, after having received a blow from a foil on the orbit, lost entirely the memory of proper names;

and he sometimes did not recollect the names of his intimate friends, and even that of his father, as he himself asserted in a letter written to Gall for advice. Cuvier, in his historical eulogium on Broussonnet, delivered at the Institute of France in 1808, mentions, that this famous botanist, after an apoplectic fit, never could recollect either proper names or substantives, though he had recovered his prodigious memory with respect to other objects. He knew plants, their figure, leaves and colours; and he recollected their epithets, but he could not recover their names.

Gall thinks that in consequence of their being destitute of this faculty, animals, as monkeys, orang-outangs &c. want the power of speech. It seems to me, that animals have this faculty in some degree; for they learn to repeat arbitrary signs, and understand them so far as they have the respective sensations; but I am of opinion that animals want speech for the same reason that they do not make fire, have no clothes, or cannot produce food. It is certain that the organs of voice are not the cause why animals have no artificial language; for some animals pronounce words and even whole phrases, nay they understand them, and yet they do not produce any artificial sign.

Certain children who are half idiots do not speak, though they do many things like reasonable persons, and sometimes manifest a great deal of cunning; and therefore their parents, relations and even physicians, cannot believe in their partial imbecility. Now though such children be not deaf, though they

can pronounce various words, yet they do not speak; and physicians often look for the cause of this in the organs of voice, as in the tongue, amygdaloid glands, palate &c.; but these parts are never the cause of the want of language. It is true that the organs of voice produce sounds, but they are not the origin or the cause of vocal language. Nay, certain persons deprived of the tongue have yet continued to speak:* their pronunciation, of course, could not be so distinct as that of other persons, they could not pronounce certain letters; but they felt the necessity of speaking, or of communicating their sensations and ideas, and they actually did contrive to speak. On the contrary, these half idiots pronounce single words very well, but they cannot maintain any discourse; they cannot keep up their attention, nor combine their expressions. These children then are destitute of the faculty of learning arbitrary signs, because they are destitute of the intellectual faculty of inventing them.

The occasional cause of this partial imbecility is two-fold. It may be a slight hydrocephalus which distends the brain and pushes the globes of the eyes forward, in the same way as a very considerable developement of the cerebral parts situated behind the orbits. Hence, such children present

* Bartholin speaks of this in a boy who lost his tongue by suppuration, produced from the small pox:—Huxham saw the same in a girl:—Schenk, Tulpius, Richter &c., speak of similar facts. There is also a dissertation by Aurran, De Feminæ Elinguis Loquela. Argentor. 1766.

the same external mark, which in the healthy state of the brain denotes great strength of this faculty. It must however be observed, that this circumstance does not prove the impossibility of discovering and knowing this organ, as certain adversaries of our doctrine have maintained: it presents only a difficulty which must be removed. The state of the whole organization must direct our judgment. The cause of the second species of this partial imbecility is some real defect of organization; the cerebral part endowed with this faculty being either wanting or very slightly developed; and such individuals never speak. Their eyes, instead of being pushed forward, lie deep in the orbits; and the roof of the orbits, instead of being flat, is very convex toward the interior of the skull. Gall has in his collection two skulls of children who had this imbecility; and the roofs of their orbits present this convexity.* He possesses also the skull of a woman of forty years of age who never was capable of learning any language, which presents similar characteristics. Thus I admit only one organ of language; and its respective faculty produces similar phenomena in respect to languages or arbitrary

* What is to be done with such children? Those of the first kind ought in every respect to be strengthened by physical education, yet not by employing too incessantly their feelings and intellectual faculties. Sometimes with age the fibres of the brain become stronger, and resist the pressure of the water accumulated in the cavities of the brain. Too early instruction is in all cases hurtful, but it is most so to children of this kind. The disease of children of the second kind is incurable.

signs, as every other intellectual faculty does in respect to external impressions. It makes us acquainted with arbitrary signs, has memory of them, judges of their relations, and produces a propensity to the employment of these functions.

Genus II.—*Reflecting Faculties.*

XXX. ORGAN OF COMPARISON.

Dr. Gall observed various persons, who, in order to convince others had, in every conversation, recourse to examples, similitudes and analogies; and seldom to reasoning and philosophical argument. In them he found, in the midst of the superior part of the forehead, an elevation which presented the form of a reversed pyramid, and he named this organ according to its functions, organ of analogy.—(*Pl.* XVII. *fig.* 1. XXX.) This organ is developed in all popular preachers beloved by the crowd, who speak by examples and parables, and who choose their similitudes from facts which are generally known. Gall accordingly possesses the skulls of two Jesuits who had this organ and its faculty in a high degree. Indeed, in order to persuade and to affect, the speaker or orator must speak by analogy: he must bring spiritual things near to terrestrial objects, and compare them with each other: he must imitate the manner of the preaching of Christ. The activity of this faculty is very important. It compares the sensations and ideas of all the other faculties; and points out their difference, analogy, similitude or identity. It compares, for instance, the functions of the five external senses with the functions of the internal faculties; and hence it

often happens, that the same vocal signs or expressions are applied to both kinds of functions, so that the same expressions are sometimes positive, and sometimes figurative. For this reason the language of every nation proves whether this organ is much or little developed in the greatest number of its individuals. If they have this faculty in a high degree, their language is replete with figure.

This faculty attaches us to comparison without determining its kinds; for every one must choose his analogies from his knowledge, or from the sphere of activity of his other faculties. He who has the faculty of space in a high degree derives thence his examples; and another from figure, or from any other faculty in which he excels. The name and place of this organ are already indicated.

XXXI. ORGAN OF CAUSALITY.

Dr. Gall remarked, that persons who like metaphysical study have the superior part of the forehead much developed and prominent in a hemispherical form, as Mendelsohn, Kant, (*Pl.* XVII. *fig.* 2. XXXI.) Fichte and others. It is also remarkable that the ancient artists have given to Jupiter a forehead more prominent than to any other antique head; and hence it would seem they had observed that the developement of the forehead has a relation to great understanding. Gall ascribes to this hemispherical configuration the love of meta-

physics; but he allows that he does not know its sphere of activity.

To this I must object, first, that in this configuration are involved both the middle and lateral parts, and the special faculty of the lateral cannot be the same as that of the middle parts. It happens indeed that sometimes the middle, sometimes the lateral parts, are most developed. Moreover, the name metaphysics does not designate a special faculty. Hence I ask, what is the special faculty of the lateral parts? Let us examine what is the most active faculty of metaphysicians. Their object is to investigate the nature of every thing, even the nature of God, and the immortality of the soul. Though, with Kant and others, I think that it is impossible by reasoning to penetrate the profundity of these subjects, it may still be examined what special faculty endeavours to do this? Metaphysicians, then, endeavour to explain phenomena; but in order to do so, it is necessary to examine the relations between cause and effect. Even philosophers who explain natural phenomena by reasoning admit some cause, and explain the rest by mental induction according to the supposed cause. Hence it seems to me that this special faculty examines causes, considers the relations between cause and effect, and always prompts men to ask, Why.

Thus the faculty of individuality makes us acquainted with objects and facts; the faculty of comparison points out their identity, analogy, or difference; and this faculty desires to know the causes of all events. Consequently, these three faculties

together forming systems, drawing conclusions, inductions, or corollaries, and pointing out principles and laws, constitute the true philosophical understanding. Here the faculty of individuality must furnish a sufficient number of facts in order to permit the two other faculties to draw consequences and establish general principles. The too great activity of this faculty, or the mania of explaining, produces abuses, and has done great harm to natural knowledge, especially to physics and medicine. It is evident that it is impossible to know final causes, which yet must exist: the only thing we can know is the succession of phenomena; and if one uniformly succeed another, the preceding is considered as the cause, and the following as the effect. This latter kind of mental operation is manifested by the developement of those convolutions which occupy the upper, middle and lateral parts of the forehead.

XXXII. ORGAN OF WIT.

Persons who are called witty, who write like Voltaire, Sterne, Piron, John Paul &c., have the superior external parts of the forehead elevated. —(*Pl.* XVIII. *fig.* 1. XXXII.) Jest, raillery, mockery, ridicule, irony &c., belong to this faculty. It is asserted that wit consists in comparing objects in order to discover their similarity or dissimilarity; but the two preceding faculties also compare; and

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comparing in a philosophical way is quite different from comparing wittily. Thus the essence of this faculty consists in its peculiar manner of comparing, which always excites gaiety and laughter.

XXXIII. ORGAN OF IMITATION.

There is in the brain an organ of a faculty for which Gall never would have spontaneously thought of seeking. It seems to be a faculty *sui generis*. One of Gall's acquaintance, Mr. Hannibal, governor to the young counts Festerditsh at Vienna, who possessed the faculty of imitating in a surprising degree, and was indeed a perfect actor, desired Gall to examine his head, because he had a transverse furrow in the midst of it. Gall accordingly found the hollow place; but he at the same time observed before it, at the superior part of the forehead, a considerable elevation of a hemispherical form. Some time after, Gall observed also in the institute for deaf and dumb persons, an individual, who, the first time he put on a mask at the carnival, imitated perfectly well all the persons who frequented the institution; and he found the configuration of the upper fore-part of his head to be the same with that of Mr. Hannibal. In comparing many persons endowed with this faculty at Vienna, and during our travels, we have always found that the developement of this organ coincides with the energy of the faculty of imitation. We therefore

admit this organ as demonstrated. Thus persons endowed with a higher degree of developement of this cerebral part imitate with great precision the gestures, voice, manners, and in general all the natural manifestations, of man and animals. They are fond also of being actors.—(*Pl.* XVIII. *fig.* 2. XXXIII.)

It seems to me that this faculty has a great sphere of activity. This organ is in general more developed in children than in adult persons; and it is also known that children learn a great number of things by imitation: they do what they see done by others; they repeat what they hear told. Is it not the same with a great number of adults? Those who possess this organ much developed do not only mention a fact or an action, but they also imitate as far as possible the gestures and voice of the persons and animals they describe. In constructive arts it gives what is called expression, motion and life.

It is difficult to determine whether, and in what degree, animals possess this faculty. Some birds indeed imitate the song of others; and monkeys and apes do various things like man; but do they act by imitation, or because they have certain faculties in common with man? I believe that the latter is often the case. In the same way the imitation of singing birds may be explained by the faculty of tone, which perceives, recollects and repeats the song of other birds.

RECAPITULATION.

In this chapter I have mentioned the particular organs which are discovered, and those which are still to be verified or pointed out. I have shown the importance of determining every special faculty and its sphere of activity—points which Gall hitherto has too much neglected. I have specified various faculties, and proved the necessity of admitting others. I have divided the special faculties into two orders—and each order into two genera. The first genus of feelings contains the propensities —amativeness, philoprogenitiveness, inhabitiveness, adhesiveness, combativeness, destructiveness, constructiveness, covetiveness and secretiveness. To the second genus belong self-esteem, love of approbation, cautiousness, benevolence, veneration, hope, ideality, conscientiousness and firmness. The first genus of the intellectual faculties consists of those of individuality, form, (size, weight ?) colour, space, order, time, number, tune, and language. In the second genus are comparison, causality and wit. The last faculty I treated of—imitation—belongs to none of the four genera, but acts upon them all. I admit, as *established*, the organs of amativeness, philoprogenitiveness, combativeness, destructiveness, constructiveness, covetiveness, secretiveness, self-esteem, love of approbation, cautiousness, benevolence, veneration, ideality, firmness, individuality, form, locality, number, tune, language, comparison, causality, wit and imitation : as *probable*, the organs of adhesiveness, hope, conscientiousness, colouring and

order: and as *conjectural*, the organs of inhabitiveness, size, weight and time. I have considered in every special faculty the necessity of its existence, its use and abuse, and the result of its inactivity, and I have indicated the situation of every organ.

Here it is evident that, except the organs of voluntary motion and of feeling, all other organs of animal life are placed in the head. The organs of the faculties which are very common, and bestowed upon all animals, are placed downward in the inferior part of the head, while the faculties proper to man are situated in its highest region. The more noble the faculties are, the higher are the organs situated; and the more important the faculties, the nearer the organs toward the middle line of the head. The organs of the propensities, those of the sentiments, those of the knowing and reflecting faculties, are always placed together. The organs of the faculties which assist one another are near each other; consequently the organs may be divided into rubrics: for instance, the organs of physical love, philoprogenitiveness, adhesiveness, and the propensity to fight; the organs of the propensities to fight and to destroy; the organs of the propensities to destroy, to possess, and to conceal; attachment, and love of approbation; self-esteem and determinateness; justice, and determinateness; benevolence, hope, and veneration; the organs of size, and form; of number, and constructiveness; of number, tune, and time: the organs of individuality, comparison, and causality; the organs of wit, ideality, and imitation. Finally it follows that the or-

gans of the propensities and sentiments are larger than those of the intellectual faculties, and that the whole mass of the organs common to animals is ordinarily larger than the mass of the organs proper to man.

A double objection against this kind of considerations is made. Some adversaries object that there are too many organs; others say, that there are not enough. Those who find the organs too multiplied must know, that every organ is admitted by the same proofs, namely, by those which establish the plurality of the organs, and that it is verified by experience. The independence of one organ is neither more nor less certain than that of any other organ; and if any proofs be admitted in respect to one organ, they must be agreed to in respect to all other organs. Those who think that we do not admit organs enough must consider that every faculty may be applied to an infinite number of things: for instance, seeing is always seeing, but what an infinite number of objects may be seen? hearing is always hearing; and so on as to every external sense. It is the same with the internal faculties: constructing is always constructing, but what an infinite number of objects may be constructed &c.? Moreover, it is to be observed that a great number of actions (not a great number of faculties) result from the combination of different faculties; and therefore it is not surprising to observe so many effects produced by so small a number of them.

Are not twenty-four letters of the alphabet sufficient to compose all imaginable words? The

muscles of the face are not very numerous, yet the face of almost every individual presents different physiognomical traces. There are few primitive sounds; there are few primitive colours; there are only ten signs of numbers; but what an infinite number of combinations do not each of these present? There are probably thirty-three special faculties. Now if we consider all possible combinations of thirty-three faculties and their modifications, it would be indeed surprising if we did not observe such a number of modified functions. Hence we do not multiply the organs any more than is necessary, but we follow determinate principles in establishing each of them.

CHAPTER III.

ON PATHOGNOMY OR NATURAL LANGUAGE.

THE second part of physiognomical knowledge is pathognomy. We have seen from the preceding considerations, that by physiognomy is understood the doctrine which judges of the dispositions of the mind according to the form of the solid parts of the body. We have also seen, that it is impossible to know the dispositions of the mind by means of the shape of those solid parts which do not indicate the developement of cerebral parts, because there is no harmony or proportion between the different bodily parts; and, for this reason, all the physiognomical signs mentioned by Lavater and other physiognomists, which do not belong to the head, are quite incorrect, and even those relative to the head are only useful hints, because they concern always the shape of the whole head. Hence I repeat that our doctrine cannot be confounded with any other physiognomical system. The only physiognomical signs which we admit are drawn from the configuration of the cerebral parts.

I shall now treat of the second part of physiognomical knowledge, *viz.* of pathognomy. It consists in the motions of the soft and mobile parts, and indicates the activity of the dispositions of the mind. From the highest antiquity, this study has been consi-

dered as very important. Solomon said, "A haughty person, a wicked man walketh with a froward mouth. He winketh with his eyes, he speaketh with his feet, he teacheth with his fingers."* Ecclesiasticus observed, "that the heart of a man changes his countenance, whether it be for good or for evil; and a merry heart makes a cheerful countenance." † "The envious man has a wicked eye, he turns away his face and despises men." ‡ "A man may be known by his look, and one that has understanding by his countenance, when thou meetest him &c." § Aristotle, Cicero, Leibnitz and many ancient and modern writers have treated of this matter; and Lavater in particular has obtained great reputation by his observations. This study is indispensable to anthropologists, to artists, painters, sculptors and actors. Yet till the present time, all knowledge of this kind has consisted only in detached observations, and is unreduced to principles. To them, however, it ought to be reduced; and indeed it seems to me possible to point out determinate rules according to which the activity of the faculties and their different modes of action may be distinguished by positive signs. I am of opinion, that the natural external expressions of every faculty are as determinate as the special faculty itself. In this chapter, therefore, I shall endeavour to show the relation of the faculties to their external expressions. Gall, in speaking of mimickry, considers the motions, gestures and attitude, only in order to

* Prov. vi. 12, 13. † Ecclus. xiii.
‡ Ecclus. xiv. 8. § Ecclus. xiv. 29.

prove the seats of the organs; and he is right in saying that the motions are modified according to the seats of the organs; but this consideration alone is too limited to explain all the variety of expression. This may be the cause why the greatest number of his auditors are not satisfied with his explanations of mimickry. I cannot enter into all the details which an exact elucidation of this subject requires; but shall confine myself to general observations, in order to show with what view this study ought to be cultivated. I am obliged to do the same in respect to the subjects of some following chapters. If however circumstances should permit, I shall publish further on these subjects, which are so intimately connected with anthropology, and seem to me to be of the highest importance.

Mimickry is divided by different authors according to their knowledge of our faculties. Engel divides mimickry into that of pleasure and pain. I divide pathognomy, in conformity with my division of the faculties of man, into that of automatic and that of animal life. I subdivide the mimickry of animal life into that of the five senses and of the internal faculties. I then consider the expressions of every particular faculty; and after this, the pathognomy of the different modes of action of the faculties. Finally, pathognomy is simple—that of every single faculty; or it is compound—the effect of the activity of several faculties together. As with regard to the faculties of the mind, there are several general ideas which concern all the faculties, such also is the case with mimickry. Therefore I shall speak

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first of these general considerations, and then of the particular signs of every faculty.

GENERAL PRINCIPLES OF PATHOGNOMY.

1. As soon as any faculty of the mind is active, all the bodily parts which contribute to the performance of the respective function enter into action.

2. All motions and all activity of the auxiliary parts are adapted to the performance of the function.

3. Though the activity of only one part be necessary to any function, yet all other similar parts enter into action.

4. If any internal faculty be active, and somewhat energetic, though no function is produced, yet the external expressions take place conformably.

5. All external expressions are concordant over the whole body.

6. The external expressions are stronger or weaker according to the activity of the faculties; and they are modified in different nations, individuals, temperaments and ages; but the essential is every where the same.

7. The motions and attitude of the body are modified according to the seats of the organs.

8. External expressions are either transitory or permanent.

9. Pathognomy may be studied in respect to truth or in respect to gracefulness.

10. Finally, pathognomy is to be distinguished from pantomime.

It answers my present purpose only to mention these general principles; but they might be illustrated by many particular observations. The reader however may be desirous to know some particularities as to the special faculties; and I shall therefore shortly examine the simple pathognomy of these faculties. It is unnecessary to particularise certain motions which indicate the propensity to love; such as the head and body drawn backward and downward, and consequently in the direction of the organ.—In adhesiveness, all the motions express this propensity: there are shaking hands, kissing and embracing; the motions in general are soft, engaging and insinuating; and the voice is mild and gentle.—In combativeness, we defend or attack; and all the motions are then conformable. No blow, for instance, can be given without contraction of the muscles; and to this end, when we endeavour to give any blow, the muscles which must act are always extended in contracting the opposite ones. This contraction of muscular fibres is also observed in the vocal organs. Thus contraction is the characteristic sign of this faculty. In destructiveness, the instruments which catch and seize enter first into action; man opens his fingers, and carnivorous animals their claws. In a high degree of the activity of this faculty, men gnash the teeth, pinch, scratch, stamp with the feet, and make other motions relative to destruction.

In secretiveness all the expressions correspond. The head is drawn downward between the shoulders; the look is from below upward, and turned in all directions; and the whole body is contracted. The cunning man feigns not to observe the object he looks at; he goes on tip-toe; and his voice is soft and low. Every sign indicates concealment.—Self-love draws the head and the whole body upward and backward, and keeps them stiff. The eyes are open and staring; all the motions are measured; and the voice is slow and brief. The inactivity of this faculty, or humility, is indicated by quite opposite signs. The head and body are then bowed forward; and its highest degree is marked by prostration of the body.—In love of approbation, all the expressions of the face, voice, and motions, are pleasant: the face is smiling; the lips are softly closed; sometimes the mouth is a little pointed; the voice is engaging; and the motions light, agile and caressing. This faculty wishes to be looked at, and hence all its decorative signs.—Cautiousness lifts the head up and a little backward, puts every sense into activity, and commands attention. We listen and look around us.

In benevolence, all the expressions are lively, quiet, soft, free, peaceful and without constraint.—Adoration directs the head upward and forward in the direction of the organ; the eyes and arms take the same direction; and the fingers are opened as if to receive a certain influence from above. If we need the assistance of God, we call on him, stretch out our hands, close them together as if we

would keep the Divinity, and say, Do not leave us, we hang on thee. It is objected, that in adoration and saying of prayers, our motions are upward, because we think that God is above. But why do we think that God is above, since we are taught from infancy that God is every where. Moreover, we turn with the earth, and though after twelve hours the former above is below, we still think that God is above.—In conscientiousness and firmness the whole body is extended upright in the direction of the organ, and is rendered immoveable. The manner of speaking is short, slow and expressive, and all the motions are deliberate.

The faculty of individuality desires to know, it therefore excites the activity of the external senses. On this account, even in touching, we listen at the same time.—If we hear music, or play on any musical instrument, we listen and make various motions forward and sideward according to the cadence; the eyes are turned outward upward in the direction of the organ; and certain persons open the mouth in order to hear better:—if we reckon internally we look downward and sideward, still in the direction of the organ:—if we think of time we raise the eyes upward: if we cannot recollect any name or word, we make various motions with the eye-balls and eyelids, which are situated over the organ, and we shut the eyes or rub them with the hands.—In deep reflection, we put all the external senses in inactivity, and we keep the hands before the forehead—the seat of the organ. In general all motions show that reflection takes place in the forehead. There-

fore if we reproach any one on account of his want of reflection, we bring the hand to his forehead or to ours, to indicate its want. It seems that Sterne placed his finger upon his organ of wit, as his portrait represents him.

The second section of pathognomy concerns the modes of action of the faculties. There are general modes of action, and particular ones; and it is the same with the mimical expressions. If the faculties be inactive, there is no external expression. In perfect idiots, for instance, the muscles act according to the preponderance of their natural strength; and therefore the flexor muscles, being stronger than the extensors, produce a conformable attitude of the body. In a lazy and stupid fellow, the head hangs forward, the legs are turned inward, and the body never holds an active position. Moreover, all faculties are either agreeably or disagreeably affected; and there are also expressions common to each of these states. In every disagreeable affection, we endeavour to remove the impressions; but in every agreeable affection, we try to receive and to retain them. In the same way as we stop the nose and propel the air, if the smell be affected by any disagreeable odour, and as we shut the eyes and ears in order to avoid disagreeable impressions on these organs, so we shut all the organs of the senses, contract our limbs, and shorten our body in order to present a smaller surface, when the mind is disagreeably affected. It is quite the contrary in agreeable affections. These considerations may explain the natural signs of yes and no. The former inclines

the head forward; the latter shakes it: it seems to me, that in assenting we show our inclination by approaching the object we think of, and by the sign of denying we indicate that we would not be touched or retain the idea.

The different expressions of the particular affections are explained by the particularities of every faculty, combined with the common expressions of agreeableness or disagreeableness.—Anger is disagreeable, and is an affection of combativeness.—Anxiety and fear are disagreeable affections of cautiousness. The expressions of disdain are composed of disagreeableness, self-love, and the desire to see any one down and below us.

The third section of pathognomy contains the expressions of different characters. The greatest number of characters are compound; and therefore the compound pathognomy is as multiplied as the characters themselves—almost infinite in modification and combination. The general rule is, that in compound pathognomy the signs of every faculty are distinct, in the same proportion as the faculties which constitute the characters are active. I conclude this chapter with the remark, that pathognomy constitutes natural language; that its perfect study is difficult, but very important; and that its acquirement amply rewards for the pains which its prosecution requires.

PART IV.

PSYCHOLOGY.

I HAVE spoken of three faculties, which together constitute the true philosophical understanding. One of them makes us acquainted with objects and facts; another points out their difference, analogy or identity; and a third considers the relation between cause and effect. I am inclined to conform my whole proceeding to these principles. We have collected a great number of incontestable facts: let us now reflect on them.

I again repeat that the basis of our inquiries is never to endeavour to point out what the mind is in itself. We are observers of Nature, and as such we examine only the manifestations of the mind, and the circumstances under which these manifestations take place. We shall find that our philosophical conclusions entirely differ from those of all other philosophers. As the considerations are numerous, I shall arrange them under four different chapters. In the first, I shall consider the primitive or special faculties of the mind, and their modes; in the second, I shall show that during this life the manifestations of the mind depend on the organization; in the third, I shall point out the origin of the faculties; and in the fourth, I shall examine whether the observation of nature and natural truths can possibly be in opposition, or dangerous to morality?

CHAPTER I.

SPECIAL FACULTIES OF THE MIND, AND THEIR MODES.

THE mind, considered as the power of knowing, was the object of all the ancient, and is still the object of modern, philosophical systems. The Greek philosophers paid great attention to this subject. The Romans made no improvement in it; but only learned from the Greeks.—The first philosophers made no difference between the considerations or thoughts, and the objects which were considered or thought of: they particularly studied cosmogony, God and the soul. Later philosophers began to distinguish the considerations of the mind from the objects which were considered. There were then two classes of philosophers. Some of them admitted the senses as particular means of acquiring knowledge: others considered their testimony as illusive, and had confidence only in the understanding. Democritus admitted both kinds of knowledge, considering however that obtained by the senses as changeable and not to be depended on, and therefore giving the preference to knowledge obtained by the understanding. In respect to the objects of their philosophical examination, it is to be observed that they considered external objects much more than the nature of man.

Socrates gave a particular direction to philosophi-

cal investigation. He thought it much more reasonable to examine things in relation to man, and the principles of his moral conduct, than to speak of things which lie out of the sphere and reach of the human mind, and have consequently no relation to it. The philosophy of Socrates was in general practical. Plato also distinguished the knowledge obtained by the senses from that obtained by the mind; and observed that the former is individual and simple, while the latter is general. He admitted, moreover, certain considerations of the mind, though destitute of all experience, as necessary and positive.

After the restoration of the sciences, Bacon, Descartes and Leibnitz, excelled in philosophy, though each in a different way. Bacon established, as the basis of his philosophy, observation and induction. The essential point of Descartes's philosophy was thought, and the knowledge obtained by thought. Like Plato, Leibnitz never gave to his philosophy a methodical arrangement, of which Aristotle was so fond: his philosophy admits two kinds of perceptions, one without and the other with consciousness: it considers the knowledge by the senses as individual, accidental and changeable; but that by thinking and reasoning, as general, necessary and positive: according to this system our reasoning power is endowed with principles, and all phenomena are intellectual.

Locke maintained that all knowledge begins from experience, that all conceptions are founded on sensations, but that our mind never can acquire any

knowledge of the objects themselves. Condillac, and the French philosophers, agree with Locke about the origin of our knowledge; and they never endeavour to examine things in themselves, but only judge of their relations to each other. Hume not only confines all knowledge to mere experience, but even denies the necessity of causality. Berkeley was so far from examining the things in themselves, that he even denied the possibility of proving the existence of external objects.

The principal schools of modern philosophy, in Germany, are the critical philosophy, the transcendental idealism, and the philosophy of nature. Kant, the founder of the critical philosophy, distinguished two kinds of knowledge, an experimental (*Kritik der reinen Vernunft*), and another founded on belief (*Kritik der practishen Vernunft*). In respect to the first kind, he maintained that it is only relative, subjective or phenomenal, or that we know only the relation of the subject to the object; that we do not know either the subject or the object in themselves, but both only in their mutual relation; and that this relation constitutes their reality to us. The subject is endowed with particular categories which are applied to the object; and whatever is general and necessary in knowledge belongs to the subject, while the particular and variable is the attribute of the object. Hence all experimental knowledge is founded upon dualism—upon the union of subject and object; for even the categories, though inherent in the subject, and conceived by the mind from within, acquire objective reality

only by their application to the object. Kant, though he considered both subject and object, had however more in mind the subject than the object; and he accordingly reduced all categories, or forms according to which the mind acquires experimental knowledge, to four kinds—to quantity, quality, relation and modality; of which the two former concern objects in general, and the two latter the relations of the objects to each other and to our understanding. Thus Kant admits notions, independent of experience, as the conceptions of space, time, cause and others; and considers these conceptions not as the result of external impressions, but of the faculties of the subject: they exist *à priori*, and, according to them, we are acquainted with the objects. Our notions of morality, God, and immortality, are not experimental, but belong to the practical understanding, and originate *à priori*. Liberty is a postulatum.

Fichte went farther, and taught the transcendental idealism, according to which all certainty and reality is confined to the subject, who has knowledge only of his own modifications; and by means of abstraction and reflection, he arrives at the intellectual intuition of the subject.

The philosophy of nature rejects subject and object, makes no abstraction or reflection, begins with intellectual intuition, and professes to know immediately the objects in themselves. It does not consider the objects as existing, but as originating, and it constructs them speculatively *à priori*. Absolute

existence without qualities, and liberty, are the basis of this philosophical system.

My mind can never rise to similar conceptions: it is confined to analysis. Following the principle of Bacon, I wish to collect as many facts as possible, to compare them, and to draw conclusions, or form inductions. As the system of Locke is the basis of the greater number of philosophical opinions in England and France, I shall compare its principles with our philosophy; and shall mention how far we agree with him, and wherein our opinions are different. Like him, we think that truth is to be placed above all other considerations; and that we cannot examine the nature of the mind, but only observe its faculties.—We then examine the organs by means of which the different faculties of the mind are manifested.—Like him, we admit innate capacities, but no innate idea or innate principle. He, however, denies the innateness of ideas and principles on a different ground, viz. because children or certain adults, and even nations, are destitute of them, or possess them variously modified. These assertions, however, are no proofs, because the inactivity of the faculties is explained by the want of developement of the respective organs; and the different modifications of ideas and principles are the result of the combinations of the different faculties of which I shall afterwards treat in a particular chapter.

Locke admits only one primitive source of the activity of the mind, that is, external impressions on the senses. If we speak of the mind in general,

we still admit a second primitive source of its activity which is internal.—According to Locke, the mind begins with external sensations, and by means of its perception, contemplation, retention, comparison, and its faculties of composing and abstracting, it performs all the particular operations or manifestations of thinking and volition: the feelings also primitively result from external impressions, and mediately from the understanding. I, on the contrary, entirely separate the mere propensities and sentiments of the mind from its understanding: they exist independently of it, and are in no proportion to it: they are internal faculties which may be excited by external impressions, but they are often active by their internal power alone. They are innate as particular faculties inseparable from the nature of man, though their determinate actions are not innate.—According to Locke, moral principles must be proved; I think they must be felt; and reasoning does not produce them any more than it produces the perception of colours without the impressions of light upon the optic nerves.

In respect to the understanding, Locke thinks that, by means alone of the five senses and their impressions, it conceives the existence of external bodies, their inseparable or original qualities, as extent, figure and mobility, and also their separable or sensible qualities. I am of opinion that the mind conceives very few ideas by the five senses alone, but that the internal parts of the brain are still necessary: on this account, in treating of the five senses, I spoke of their immediate and mediate

functions; to the latter of which belongs our conceptions of the existence of bodies, their form, size, weight, colour, space, order and number. The understanding as a reflecting power acts, in my opinion, not only upon the sensations and conceptions of external objects, but also upon the propensities and sentiments: it knows them as well as the external sensations and perceptions, compares them, considers them in different ways, and determines their various relations. Moreover, I do not only admit an internal activity of the mind independent of external experience in respect to the propensities and sentiments, but also with Kant in respect to the understanding, and even in respect to experimental knowledge as well as to the reflecting powers. The conception of size, for instance, that the whole is greater than the half, is not the result of experience, but of an internal faculty; and in the same way the conception, that there is nothing without a cause, is internal. These general conceptions are the attributes of the internal faculties of the understanding, in the same way as the particular feelings result from the propensities and sentiments. The internal general conceptions of experimental knowledge, and the particular feelings are calculated for the external world; and the general conceptions of the reflecting powers of the mind are calculated for experimental and sentimental knowledge. This second knowledge then is as positive as the former; for we know our feelings as well as our sensations and perceptions by the five senses. Every determinate action of any faculty whatever depends on two conditions, on the

faculty and its object. The activity of every faculty, or the general conceptions of the knowing faculties, and particularly the feelings, are merely applied to the external world; and the general conceptions of the reflecting faculties are applied to experimental knowledge and to the feelings. In a perfect state all conditions must agree with each other. If, for instance, external impressions do not agree with the general state of man, and with the respective internal faculties, they are illusive; and if internal faculties suppose in the external objects something which experience does not confirm, they also are erroneous: each condition corresponds with another. All conditions must be conformable to the conceptions of reflection, and these must be applicable to the actions of the particular faculties.

Thus, in a perfect system of the knowledge of man, all the particular faculties must be pointed out and considered in their concordance. I admit internal powers and intermediate faculties by means of which the internal powers and the external world are brought into communication and mutual influence. The internal faculties are essentially different, and they may act by their internal power, or be excited by respective impressions. Some of them make man act; while others modify, assist and direct our actions: some procure for us a relative knowledge of external beings; and others are destined to bring all the faculties into harmony, in order to constitute unity. If such a system be practical, it requires first a knowledge of particularities, and if

these be capable of useful application, they must be reduced to generalities and even to unity.

Having presented this general view, I shall enter into some details interesting to every philosophical reader. Our philosophy is in general very simple. In the physiological part, when treating of the plurality of the organs, I have mentioned, that many ancient and modern philosophers and physiologists have divided the functions of the mind, and admitted different faculties; yet they had no conception of the primitive or special faculties of the mind; and they considered as such only general and common faculties, or modes of the faculties.

In order to understand this assertion, it is necessary to consider the difference between the faculties. I admit three kinds of faculties: general, common and special faculties—a division which is quite general throughout all nature.

In inorganic bodies, there are general qualities, which must be specific in determinate bodies: for instance, size, figure, weight and consistence, are general qualities of all bodies, and in order to indicate any determinate body, as gold, silver, iron, copper &c., these general qualities must be specified. Moreover, several qualities are common to metals, or to salts, or to earths, and these common qualities must also be specified in order to distinguish every sort of metal, salt or earth. In vegetables also there are general properties of vegetation, as to be produced by its like, to be nourished by intussusception, to assimilate the food, to increase, decrease,

and die; and all these phenomena must be specified in designing any particular plant, as an apple-tree, a rose-bush; while there are also qualities common to various orders of plants. Such also is the case with animals both in their automatic and animal life: their phenomena generally analogous bear also a general name; and their phenomena common to a certain order of functions are designated by a common name. Secretion, for instance, is a common function; but the secretions of saliva, bile, tears &c., are particular. Sensation is an expression which indicates the common function of the five external senses; but every determinate sensation, as of sight, hearing, smelling, taste or feeling, is special.

In the same way all philosophers and physiologists have hitherto spoken only of general or common faculties of the mind. Thus, it is generally said that animals act by instinct, and man by understanding. *Instinct* however is only a general expression, and denotes every inclination, every internal impulsion: but the determinate impulsions or instincts, as the instinct to migrate, to gather provisions, to build or to sing, are special. Moreover, it is said that man acts by understanding in opposition to the instinct of animals; and here we must inquire first, whether animals act only and always by instinct; and secondly, whether understanding indicates a special faculty.

As instinct denotes any internal impulsion, many actions of animals, as the industrious labours of insects, are certainly the result of some internal

impulsion or instinct; but many animals modify their actions; in order to do so, they choose even among different motives: these actions therefore are not the effect only of an internal instinct. A dog may be hungry; but he may not eat because he fears the blows of his master: certainly this dog does not act only from instinct, but shows a certain degree of understanding; for understanding is the knowledge of our faculties and the power of modifying their actions: thus all the actions of animals are not the result of mere instinct. On the other hand, if new-born children cry, and suck the finger, they do not act from understanding. If men of great genius manifest talents without knowing that such manifestations exist—if they calculate, sing, or draw, without having seen or heard of such things having been done, does it not happen by some internal impulse or instinct, in man, as well as in animals which sing, build, migrate, gather provisions, by a mere internal impulse or instinct? Hence understanding is not a prerogative of man in opposition to instinct in animals. Let us now examine whether understanding is a special faculty.

Understanding is an expression which designates a general faculty; and there are different determinate species of understanding. This is even the case with all the common faculties of the understanding, of which philosophers and physiologists speak, namely, with *perception*, *memory* or *reminiscence*, *judgment* and *imagination*. These expressions are common; but every peculiar perception, memory, judgment and imagination, as of space,

form, colour, tune and number, belong to a particular faculty. If these faculties of understanding were particular ones, the person who possesses any common faculty ought to be endowed with all its particular kinds. If, for instance, instinct were a peculiar faculty, an animal which should have one instinct ought to have all instincts. If perception, memory, judgment or imagination were special faculties, any one who has perception, memory, judgment or imagination, ought to possess all kinds of perception, of memory, of judgment or of imagination. Now this is in opposition to all experience. One may have a great memory of one kind, and a very defective memory of other things. A poet possesses one kind of imagination in a high degree, but has he therefore every kind of imagination, as that of inventing machines, of composing music &c.? A speculative philosopher may be satisfied with general and common expressions, which do not denote particular and determinate properties of different beings; but these general or common considerations are insufficient for the naturalist, who endeavours to know the functions and the faculties of every organic part in particular. Throughout all natural history, the expressions are the less significant the more general or common they are; and a distinct knowledge of any being requires a study of its particularities.

Moreover, affections and passions have often been considered as peculiar faculties; and philosophers have even divided the faculties into natural and factitious.

In the physiognomical part I have stated the primitive faculties such as I admit them; have spoken of propensities, sentiments, knowing and reflecting faculties; and in general, have examined the different divisions and subdivisions of the faculties of the mind. I shall now consider the different modes of action of every faculty, a kind of consideration which Dr. Gall has altogether quite overlooked. The modes of action of the faculties of the mind are either general, that is, they may take place in every faculty; or they are common to several faculties; or they are proper to some one special faculty.

The general modes of action which may be applied to all the faculties of the mind; to propensities, to sentiments, to knowing and to reflecting faculties, are the following. Every faculty of the mind may be in a state of less or greater inactivity. There are then different expressions in order to designate these degrees; as heaviness, indifference, laziness, negligence, apathy. The complete want of activity is called imbecility, if the faculty never existed; and fatuity, if the faculty have been suppressed by any disease. Faculties, being active, may manifest more or less energy; and there are various expressions for denoting this state. To like, for instance, is a general expression; for every faculty, being active, likes, or produces some inclination, some propensity or desire. Tranquillity and patience designate a less active state of the faculties: impatience, on the contrary, denotes a very active state: we may be quiet and tranquil in respect to one object, and impatient in respect to another.

Temperance indicates the best degree of activity of every faculty; intemperance, too high a degree of it. Other expressions which designate the different degrees of activity of every faculty are inclination, desire, longing, want, ardour, passion, and, in the diseased state, irresistibility. Here it is to be observed that, according to our doctrine, passion denotes only the highest degree of activity of every faculty; and therefore this expression must not be confounded with that of affection, which I shall speak of immediately. Thus the first kind of the general modes of every faculty consists in the different degrees of activity, from imbecility to passion and irresistibility.

The second kind of general mode of action is, that every faculty may be actuated harmoniously or unharmoniously, that is, every faculty may be agreeably or disagreeably affected. *Affections* then are only modes of action of the special faculties, and not at all special faculties themselves. They are divided into two classes, agreeable and disagreeable, and every class admits of different degrees. The different degrees of the agreeable affections are called pleasure, joy and ecstasy; and those of the disagreeable affections are termed pain, grief and misery. According to these considerations, it is easy to rectify the confusion of ideas and expressions observed in various writings in respect to the affections and passions. *Passion* ought to be employed as indicating only the highest degree of activity of every faculty. The word affection, then, though sometimes employed as synonymous with passion,

sometimes as designating certain special faculties—pride, ambition, friendship, hope &c., and very often as expressing the different modes of action of the various sentiments—shame, anger, fear, fright, terror &c., indicates, according to us and according to its etymology, only the modes of being affected. Hence affections are only modes of feeling, and belong particularly to certain propensities and sentiments.

The affections of propensities and sentiments may also be divided into simple and compound. Simple affections, for instance, are—anger, of the propensity to fight;—fury and rage, of the propensities to fight and destroy;—anxiety, sorrow, anguish, fear, terror and melancholy, of cautiousness;—pretension, pride, contempt and disdain, of self-love;—compassion, of benevolence;—contrition, repentance and remorse, of justice. The compound affections are jealousy, of which egotism forms the basis, and which is modified according to the other organs which desire; envy, which is jealousy without benevolence; shame, the result of love of approbation combined with justice; and consternation and perplexity the result of much cautiousness, much love of approbation, and little propensity to fight &c.

In respect to the intellectual faculties there are also some expressions, as to learn, know, think and to be attentive, which belong to every one of them. Some other common expressions designate the different degrees of their activity, as perception, memory, and imagination. Gall speaks of four degrees

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of activity in every organ of the brain—of perception, memory or reminiscence, judgment and imagination. Gall admits perception in every organ; while I make use of the name perception only in respect to the intellectual faculties, and of the name sensation in respect to every faculty of animal life. Every faculty which has consciousness has sensation; and every faculty which perceives impressions made upon it has perception: thus any being which feels hunger or physical love has the sensation of hunger or physical love; and any being endowed with the faculty of colouring, or which is capable of perceiving colours, has perception of them as soon as its faculty acts upon them. Thus perception is a common expression of the intellectual faculties.

It is the same with *memory* or *recollection*, which is the reproduction of perceptions. Now propensities and sentiments cannot be reproduced voluntarily, consequently it is impossible that we have any memory of them: it is only possible to remember that they have existed; as that we have been hungry, that we have felt the propensity to physical love &c. It is possible however to renew the perceptions of the intellectual faculties, as the impressions of form, size, colour, tone &c.; and this internal reproduction of the perceptions of external impressions ought alone to be termed *memory*. It follows that there are as many memories as perceptions, and that memory is not a special faculty. This is also evident from the following consideration: if memory were a special faculty, he who has one kind of memory ought to have all kinds of it; but this opinion is

refuted by daily experience. Thus as the perception of every faculty has its seat in the respective organ, so also the memory of every faculty resides in the organ of the faculty, the memory of tones in the organ of tune, the memory of colour in the organ of colouring &c.

Gall thinks that memory and reminiscence are only two modifications of every faculty: reminiscence being the faculty of recollecting that we have perceived the impressions, and memory the faculty of renewing the impressions which we have perceived, and therefore a still higher degree of activity. Here, then, I must first observe that I do not think memory an attribute of every faculty of the mind; for what memory can be attributed to propensities and sentiments? Every faculty of animal life produces some sensation, and the sensations of the intellectual faculties are called perceptions; but as we cannot reproduce propensities and sentiments voluntarily, they are destitute of memory, which can belong only to the intellectual faculties. Moreover, I distinguish *memory* from reminiscence; for it is possible to have some reminiscence of all propensities and sentiments without memory, that is, without reproducing them: accordingly, in respect to the intellectual faculties, we have sometimes the reminiscence of an impression without being able to reproduce the perception: for instance, we may know that we were acquainted with some particular name, we may know that we have heard some music, that we have seen some person &c., but we may not be able to recollect the name, the music, nor the

person. A certain person lost, during a nervous fever, all reminiscence; but he spoke French, and was astonished to find that he had learned it; and he played upon a musical instrument without recollecting that he had had a music-master. Sometimes we repeat an air in music without recollecting where we have heard it. Thus memory and reminiscence may exist separately; and it therefore seems to me that they do not belong to every intellectual faculty. I consider memory as an attribute of every knowing faculty, and as the second degree of its activity; while reminiscence is the same degree of activity of the organ of individuality. This faculty knows what happens in the other organs; and if it reproduce its perceptions, it produces reminiscence in the same way as the other knowing faculties produce memory, when they reproduce their perceptions.

Gall considers judgment as the third degree of activity of every organ; and he admits as many kinds of judgment as there are special faculties. Now, in the first place, it does not seem to me that judgment is an attribute of every faculty of the mind; for what judgment have pride, circumspection, and, in general, all the propensities and sentiments? In my opinion, judgment belongs only to the intellectual faculties. Moreover, I cannot consider judgment as the third degree of activity; for some individuals judge very well as soon as they perceive impressions, without possessing the respective memory; and other persons have an excellent memory of a particular kind of impression,

and a bad judgment of the same faculty. It even happens that in some individuals certain faculties are active in the highest degree, while the same persons judge badly in respect to these very faculties. Hence it follows that judgment is not the third degree of activity. Before I explain what I consider judgment to be, I shall treat of imagination as being in reality the highest degree of activity of every faculty. *Imagination* is an internal activity of the faculties when unexcited by external circumstances; and there are as many kinds of imagination as there are special faculties. It is the same with propensities, sentiments, knowing and reflecting faculties. We are hungry without the presence of food; we feel physical love when in solitude; and certain persons are cautious, or pious, or like to play on musical instruments, to sing, to draw, to travel, to calculate, to build &c., without being excited by external impressions, nor do they repeat the impressions which they have perceived. This degree of activity then is designated by the word imagination in respect to the intellectual faculties. It is essentially the same in respect to all faculties in man and animals, in which last it is called *instinct*. Both imagination and instinct then are common expressions, and applied to different kinds of faculties, but they indicate essentially the same degree of activity, that is, some activity excited from within; for if animals sing, build, choose a dwelling &c., without rational determination and only by instinct, they act by their internal faculties. In the same way, men endowed with genius in music, ma-

thematics, mechanics &c., act by the energy of their respective internal faculties.

Thus I think that, in respect to the intellectual faculties, there are only three degrees of activity: perception, memory and imagination. I shall now examine what, according to my opinion, judgment is. I consider judgment as a mode of action of the intellectual faculties. Propensities and sentiments have only the judgment called agreeable and disagreeable. Intellectual faculties are equally affected in an agreeable or disagreeable manner; but in them, there is also some relation between the faculties and their respective external impressions; and every one who considers the relation which exists between his faculties and the external impressions, judges. In this sense, judgment belongs to all degrees of activity of every intellectual faculty, in which good or bad judgment must alone be spoken of; and any intellectual faculty may be very active without having accurate judgment. The functions of the reflecting faculties especially receive the name judgment, but their judgment essentially considered is only some mode of their action, as is that of the intellectual faculties in general. The faculties of tune, colouring &c., perceive and know the relations of tones, of colours, &c., and approve particular relations in the same way as the reflecting faculties distinguish analogies or dissimilitudes, and point out the causes of phenomena.

It is obvious that the laws between the external impressions and internal faculties are determinate, and essentially the same in individuals of the same

kind, as in man; but that the actions of every faculty must be modified, and consequently also the judgments. This idea however will be farther elucidated in another chapter. Thus it results that judgment is only a mode of affection of the intellectual faculties, and not a degree of their activity; or, in other terms, that it is a mode of quality and not of quantity.

It remains for me to speak of the association of ideas, and of the associating power. Is there, then, a peculiar absolute faculty of association, of which modern philosophers speak so much? The name association, according to my opinion, designates only a phenomenon which is quite general, and not confined only to the intellectual faculties. It is true that one intellectual faculty, being active, excites one or several others, which then constitutes the association of ideas; but this mutual excitement takes place also with propensities and sentiments. Certain philosophers consider the association of ideas as the effect of habit, and not as a law of our nature: it must however be admitted as an innate principle. Many admit a primitive associating power which I deny: the faculties exist and are only associated. Moreover, as the energy of the different faculties varies in different individuals, it may easily be conceived why the facility, with which ideas are associated, is very different in different persons. Faculties, the organs of which are neighbouring, or which are active at the same time, will easily excite one another. Moreover, the faculties which contribute to the same function will easily excite one

another, in the same way in animal as in organic life. Hence the principles of association are essentially the same as those of sympathy or consensus.

The mutual influence of the faculties upon each other explains also the principle of mnemonics, and shows their importance. It hence follows however that the same mnemonical rules cannot equally apply to every person. One person, for instance, will more easily recollect ideas by the assistance of space, another by that of form, colour, or number, &c. This consideration ought, in its whole extent, to be employed in education. Never ought one intellectual faculty alone, but all those which are necessary to a perfect knowledge of an object, to be exercised together. I may endeavour farther to elucidate this matter by considering the opinion pretty generally believed, that every one thinks in his mother tongue. The meaning of this phrase is not distinct, and should be determined. We do not think in any language in the sense, that the language primitively produces our thinking; for the feelings and ideas exist before the signs, and therefore we may have feelings and thoughts without any sign or language. The signs are only associated to the feelings and thoughts; but as this association is extremely quick, takes place instantaneously, and corresponds to our manner of thinking, it is therefore said that we think in our native language. This fact however proves the importance of association, mnemonics, and the mutual influence of the faculties in general. The vocal signs excite again the feelings and thoughts, and in the same way the ideas

of form, size, colour, space &c., may reproduce the vocal signs; or size may excite the idea of colour, or colour the idea of order, and so on.

RECAPITULATION.

It results from the reasoning contained in this chapter, that our philosophy of the mind is quite different from all others; that formerly no primitive or special faculty was known; and that philosophers considered merely general and common faculties or modes of the faculties of the mind. Whatever I have said in respect to the modes of action of the special faculties may be reduced to two general considerations.—Every faculty may be more or less active, and the activity of every faculty may result from its internal energy, or it may be excited by corresponding impressions; and in this respect I have considered the different names given to the different degrees of activity. Moreover, every faculty may be affected differently, and these different affections or different modes of action bear equally different names.

CHAPTER II.

THE MANIFESTATIONS OF THE FACULTIES OF THE MIND DEPEND ON THE ORGANIZATION.

IT is an important question in philosophy to determine, in respect to the human mind, whether the manifestations of its faculties are dependent on the organization. I have several times stated, that we make no inquiry into the nature of the faculties of the mind; and that we observe only its manifestations, and the conditions under which they take place. In respect to a great number of the functions of animal life, it is granted that they cannot take place without organization; and such is the case with voluntary motion and the functions of the five external senses. In conformity with this we maintain, that all the manifestations of the mind—feelings and intellectual faculties, propensities and moral sentiments, reason and will, depend on the organization; and we establish our assertion by incontestable facts, and by reasoning founded on them. This chapter contains the proofs from reasoning founded on facts which have been sufficiently detailed in the chapter on the brain as the organ of the mind, and in that on the peculiar organs. Let us, then, examine this part of psychology.

DIFFERENCE OF THE SEXES.

The manifestations of the faculties of the mind are modified in both sexes; some faculties being more energetic in men, and others in women. Do the souls of women therefore differ from those of men; or is it more probable, that the manifestations of the faculties are modified because the organs or instruments vary? I have already mentioned that Malebranche * deduces the different manner of thinking and feeling in men and women from the delicacy of the cerebral fibres. According to our doctrine, certain parts of the brain are more developed in men, and others more in women; and in that way is the difference of the manifestations of their faculties perfectly explicable. There are doubtless a great number of exceptions, in which the intellectual faculties of some women resemble those of men, and *vice versâ*. This explanation, however, must be admitted, since I have demonstrated that the manifestations of every faculty depend on some peculiar organization. Facts show that the difference of the manifestations of the mind in men and women depends on the organization.

INDIVIDUALITY OF EVERY PERSON.

The manifestations of the faculties of the mind and understanding are modified in every individual.

* Tom. i. 5me Edit. p. 155.

Now is it probable that the soul of each individual differs?—On the contrary, it is said that all mankind have descended from the same original parents; and accordingly all the modifications of our faculties are easily explained by the difference of their respective organs. All animals of the same species, and all men, have essentially the same corporeal parts; and there is merely some difference of proportion and developement in the different parts of the organization. These differences of the organs then produce differences in the manifestations of the respective faculties.

AGES.

The manifestations of the faculties are modified in different ages. Either then the soul changes, or the instruments of the soul are changed, and its manifestations thereby modified. The same law exists in respect to automatic and animal life; in both of which certain faculties manifest themselves earlier, and others later, according to the developement of their respective organs. The nervous systems of the abdominal and thoracic viscera are almost perfect, while the brain seems to be only a pulpy mass: hence their earlier activity. The nerves of taste and smell are sooner developed than those of hearing and seeing; and therefore their respective functions manifest themselves earlier: this is obvious principally in those animals which are born blind and deaf.

It is the same with the moral sentiments and

intellectual faculties: their manifestations are not simultaneous; for several faculties manifest themselves from infancy, while others appear later; and in the same manner several faculties disappear earlier, while others last till the end of life. Now as we see that the manifestations always accord with the state of the organic conditions, it is impossible to deny that the manifestations of these faculties depend on the organization.

RELATION BETWEEN THE ORGANIZATION AND THE MANIFESTATION OF THE FACULTIES.

Moreover it may be demonstrated, that the manifestations of the faculties exactly correspond to the developement of the organs. The faculties of the mind manifest themselves, increase and gradually diminish, in the same proportion as their respective organs are developed, increase and decrease. In new-born children, the brain shows scarcely any appearance of fibres; and the fibres are sooner visible in the posterior and middle lobes, than in the anterior. It increases by degrees, and attains perfection between 30 and 40 years. About that time, it seems to undergo very little change for several years; but in proportion as the individual advances in age, the cerebral fibres become firm; the whole brain diminishes; and the convolutions, which in maturity are plump, become flabby. Thus does the brain undergo the same organic changes as every other corporeal part. The cerebellum increases very late in life.

In precise conformity with this successive growth, stationary state, and decrease of the brain, do the relative functions manifest themselves. In new-born children, animal life is confined to spontaneous motions, to the perception of hunger and thirst, to some obscure sensation of pain and pleasure, and to the external senses; and even these functions are very imperfect. By degrees the inclinations and propensities become more numerous and more energetic; and children acquire some determinate ideas of external objects, and ultimately become acquainted with them. The child advances to boyhood, adolescence and manhood; and then all these faculties manifest the greatest energy. By degrees they begin to decrease; and in the decrepitude of old age, the sensations are blunted, the sentiments weak, and the intellectual faculties almost or entirely suppressed. As, then, the manifestations of the faculties of the mind and understanding are proportionate to the organization, it is evident that they depend on it.

Again if the organs of the faculties do not follow the natural order of increase, if their developement be either too rapid or too tardy, then the respective functions undergo the same change in their manifestations. Thus in rickets, when the intellectual faculties act with greater energy than the age of such children requires, their brain is also extraordinarily developed or irritable. Independently of this disease, it sometimes happens, that some part of the brain is too soon unfolded, and then its functions are equally premature. We have seen several chil-

dren from three to four years of age, whose cerebellum had acquired an extraordinary growth; and these individuals manifested also a particular desire for sexual intercourse. There are similar instances in respect to every particular faculty and every respective organ.

On the other hand, when several parts of the brain, or the whole brain, arrive very late at the state of maturity, such children retain their childishness, and are sometimes half stupid till about 10 or 12 years of age, so that their parents despair of their rationality: but at that age the organs sometimes acquire a particular developement, and the manifestations of their faculties are then simultaneous. One of the most distinguished physicians at Berlin, when 10 years of age, could not yet make use of his organs of speech; and Gessner at the same age had improved so little that his preceptor declared him half an idiot; yet it is known how famous he afterwards became.

If the growth of the organs be incomplete, the manifestations of the faculties are equally defective. It is indeed impossible precisely to determine the degree of cerebral developement, necessary to the regular manifestation of the intellectual faculties; for these manifestations depend not only on the size of the organs, but also on their internal constitution. A brain too small, however, is always accompanied with imbecility. Willis describes the brain of one who was an idiot from birth, which was not more than half the ordinary size. Professor Bonn of Amsterdam possesses two such skulls, as

well as the brain of one who was an idiot from birth, who was born at Amsterdam, where he was shown for money as an African savage, and who lived till the age of 24 (*Pl.* IV. *fig.* 1). We have seen several such heads in different collections: Pinel has one; Gall has two.

It is to be observed that, in general, the heads of idiots are either too small or increased in size by hydrocephalus—water collected in the cavities of the brain: but in proportion as the organization of the brain becomes more perfect, the faculties of the mind manifest themselves more distinctly; the inclinations become subordinate; the ideas clearer; and the manners more significant. In respect to idiots it must be observed, that sometimes imbecility is not general, but merely partial; and accordingly parents often, and even physicians, cannot conceive how a child should be deemed an idiot, though he answers reasonably and executes correctly many things relative to household affairs. We saw at Hamburgh a young man 16 years of age, the inferior parts of whose brain were favourably developed, but whose forehead was scarcely an inch in height, and in whom consequently the improvement of the superior parts of the brain was impeded; he had accordingly only the functions of the inferior parts: he recollected names, numbers, chronology and historical facts, and repeated them in a mechanical manner; but the functions of the superior parts of the brain, as comparison, reflection, judgment, sagacity, penetration &c. were utterly wanting in him. Even reasonable and very intelligent persons

are sometimes extremely ill provided with this or that particular faculty.

If the organs have acquired an extraordinary developement, the faculties manifest themselves with particular energy. Hence the history of all times, and the languages of all nations, denote great genius by an expansion of the head (*Pl.* IV. *fig.* 2.); and several ancient artists have perfectly well imitated this difference; giving to priests and philosophers, for instance, a head quite different from that of gladiators. Modern artists are entirely wrong in believing that the head bears a certain proportion to the rest of the body, and that, in this respect, the Apollo Belvidere ought to be considered the model of human perfection. This beautiful form would not indeed agree with an idiot, but it is quite insufficient for the faculties of a Socrates. Had the ancient artists perfectly understood the laws of the organization, they would not have thought it necessary to hide the head of Pericles with a helmet because it was disproportionate in size with his body.

Children possess sometimes the same organic constitution of brain as their parents; and such children manifest the moral and intellectual faculties in the same degree. It is even observed, that the characteristic form of heads is often transmitted from generation to generation; and then the faculties of the mind and understanding are propagated in such families during as many centuries. It is an acknowledged fact that children, who are like one another or like their parents, manifest similar faculties, as far as the difference of age and sex admits. We have

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seen two twin-boys so like each other that it was almost impossible to distinguish them; and their inclinations and talents presented also a striking and astonishing similitude. Two others, twin-sisters, are very different: in one the muscular system is the most developed, in the other the nervous; and while the former is of little understanding, the second is endowed with strong intellectual faculties. It is the same with animal as with automatic life; and as the dispositions to certain diseases, as gout, consumption, deafness, dropsy &c. is propagated from generation to generation; in the same manner, certain propensities, sentiments and intellectual faculties, even certain inferior inclinations, imbecility and the disposition to mental diseases, are transmitted from parents to children. It is known, that musical talent is sometimes hereditary in certain families; and Gaubius relates, that a girl, whose father had killed men in order to eat them, and who was separated from her father in her infancy and carefully educated, committed the same crime: from this fact Gaubius concluded, that the faculties are propagated with the organization. It would be of the highest importance to know the laws according to which the different dispositions and faculties are propagated from parents to children, and why the same parents occasionally beget quite different children: our knowledge, in this respect, is very defective; and it is impossible to arrive at any thing determinate before we have infinitely multiplied observations of this kind.

From all these considerations it results, that there

is so close a relation between the manifestations of the faculties and the organization, that the former must depend on the latter.

SLEEPING AND DREAMING.

The state of watching, sleeping and dreaming, proves also, that the manifestations of the faculties of the mind depend on the organization; for corporeal organs alone can be fatigued and exhausted. It is known that the operations of the soul, or of the faculties of the mind, cannot continue to act incessantly with equal energy—that rest is necessary and unavoidable; and this inactive state of the faculties of the mind is *sleep*, during which new forces are collected; and after awaking, the functions proceed with new energy.

If single organs be excited by any stimulus whatever, and enter into action while other organs are inactive, partial sensations and ideas, or *dreams*, arise. The nature of these dreams is almost always the result of certain material causes, and they are conformable to the age and organic constitution of the body. Men and women, endowed with a very irritable nervous system, find in their dreams impediments without end: they generally suffer pain and anxiety. This relation between our dreams and our organization, verified by an infinity of examples, evidently proves that the manifestations of the faculties of the mind and understanding depend on the organization.

EXERCISE.

The possibility of exercising and training the faculties of the mind,—education, proves also the dependence of their manifestations on the organization; for it is inconceivable how an immaterial being can be exercised.

INFLUENCE OF THE PHYSICAL CONDITIONS.

All that disturbs, excites or weakens the organization, chiefly that of the nervous system, changes also the manifestations of our faculties. It is a general observation, that the organs are weakened if their increase be too rapid; and for the same reason it is, that their functions are less energetic. This is principally to be observed at the climacterical years, or at the periods of increase, which are very important to be known in practical medicine; for the body does not grow always in the same proportion. This equally takes place in plants, in animals and in man. It is known that vegetables increase sensibly at two periods; first in the spring, and secondly in the middle of summer: the growth of man is also stronger at certain periods than at others. Now each sudden increase weakens the organs, and consequently their respective functions; and this is the case in respect both to automatic and to animal life. Girls who increase too suddenly grow pale, and undergo chlorosis; young men become consumptive &c. and such individuals, during their periods of growth, are not fit to be employed, or

much to exercise their intellectual faculties: rest is necessary till the organs have acquired a state of maturity, when the faculties of the mind again operate with great energy. Sometimes the organs are too soon developed, or too much exercised, and thence often results an incurable exhaustion; such early genius ultimately becomes quite ordinary. I have already mentioned also that weak intellectual faculties, principally in children in whose heads water is collected, sometimes become stronger, so that they afterwards exhibit peculiar energy.

In grown-up men and animals, the organs are still subjected to different degrees of excitement according to the seasons, temperature, food, and principally according to particular laws of the organization. Hence in animals, at different periods, we see appear and disappear their instinctive labours, their inclination to sing, to build, to gather provisions, to live solitarily or in society, to migrate &c. In man the faculties do not always manifest the same degree of energy. Who can mistake the influence of periodical evacuations, as of the catamenia, of hemorrhoides &c.; or that of pregnancy, of digestion, of fasting, and of all that exhausts the corporeal powers? Who can deny the influence of diseases upon the manifestations of our faculties; that of external and internal excitement, of agreeable sensations, of fine weather, of music, of dancing, and similar circumstances? Now all these influences act only upon the organization; and consequently the manifestations of the faculties depend on the organization.

Sometimes very inert and defective manifestations grow very active when excited by external or internal causes. Haller relates, that an idiot, who was wounded on the head, manifested great understanding while the wound lasted; but as soon as the wound was cured fell into his former stupidity. He speaks of another patient whose eye was inflamed, and who saw perfectly well at night during the time of his illness. Father Mabillon, in his infancy, showed very limited faculties; but he got a blow on his head, and from that moment he manifested talents. We have been told of a boy who at fourteen years of age seemed incapable of improvement, but having fallen down a staircase and got several wounds in his head, after that period he excelled in his studies. We have seen a girl nine years of age, who had received a blow on the right side of her head, and who afterwards complained of pain on the opposite side: by degrees her right arm grew weak and almost paralytic; her inferior jawbone trembled incessantly; and she was often seized with convulsions: but her intellectual faculties had acquired a high degree of energy and perfection, and her manner of behaviour was very imposing. There are many facts of this kind. I shall mention only one other case, inserted in the Edinburgh Review,* and extracted from a description of the Retreat, an institution near York for insane persons of the Society of Friends, by Samuel Tuke: " A young woman,

* N° XLV. April, 1814, p. 197.

who was employed as a domestic servant by the father of the relator when he was a boy, became insane, and at length sunk into a state of perfect idiocy. In this condition she remained for many years, when she was attacked by a typhus fever: and my friend, having then practised some time, attended her. He was surprised to observe as the fever advanced a developement of the mental powers. During that period of the fever when others are delirious, this patient was entirely rational. She recognized, in the face of her medical attendant, the son of her old master, whom she had known so many years before, and she related many circumstances respecting his family and others, which had happened to herself in her earlier days. But, alas! it was only the gleam of reason: as the fever abated, clouds again enveloped the mind; she sunk into her former deplorable state, and remained in it until her death, which happened a few years afterwards." These facts are positive, and there cannot be any doubt that similar causes change surprisingly the exercise of the faculties of the mind; yet they act immediately upon the organization alone. Hence we are obliged to conclude, that when these physical and organic causes produce the manifestations of the most impudent lasciviousness, the most arrogant pride, a complete despair which rejects all consolation, &c. the cause of these manifestations depends on the organization.

Finally, as it is really possible to demonstrate the respective organs of the propensities, sentiments

and intellectual faculties, it is impossible to deny that their manifestations depend on the organization.

The essential part of this principle has been known from the remotest antiquity. A great number of ancient and modern, profane and religious, writers taught it. Plato considered the body as a prison for the soul. Seneca (Epist. 66,) says, "Corpus hoc animi pœna ac pondus est." Hippocrates and Galen, and all physicians and physiologists, however different their opinions, make all the manifestations of the soul depend on the organization: namely, the intellectual faculties on the brain; and the affections, passions, and moral sentiments on the temperaments. Boerhaave and Van Swieten attribute to the brain not only all ideas with their combinations, and all reasoning, but also the moral character and the essence of man. The Cartesians, by their doctrine of the tracks which they admit in the brain, acknowledge the influence of the brain on the intellectual faculties. Malebranche, when explaining the difference of the faculties of both sexes, and the various kinds and particular tastes of different nations and individuals, by the firmness and softness, dryness and moisture of the cerebral fibres, remarks that our time cannot be better employed than in investigating the material causes of human phenomena. Charles Bonnet said, that mankind can only be known and penetrated by their physical nature. St. Thomas* said: "Though

* Contra Gentiles, c. n 12. 9.

the spirit is no corporeal faculty, the spiritual functions, as memory, imagination, cannot take place without the bodily organization. Therefore if the organs cannot exercise their activity, the spiritual functions are disturbed. For the same reason a happy organization of the human body is always accompanied with excellent intellectual faculties." St. Gregorius Nyssenus * compared the body of man to a musical instrument. "It sometimes happens," says he, "that excellent musicians cannot show their talent because their instrument is in a bad state. It is the same with the functions of the soul. They are disturbed or suspended according to the changes which take place in the organs: for it is the nature of the spirit that it cannot exercise conveniently its functions but by sound organs." St. Augustine,† St. Cyprian,‡ St. Ambrose,§ St. Chrysostom,|| Eusebius, and others, consider the body as the instrument of the soul, and distinctly teach that the soul is regulated according to the state of the body. Thus all natural philosophers and physicians, and all the fathers of the church, agree with us, that all the manifestations of the mind depend on the organization.

* De Hominis Opificio, c. 12.
† De Lib. Arb.
‡ De Operibus Christi.
§ De Off.
|| Hom. ii. iii. super Epist. ad Heb.

RECAPITULATION.

According to the facts and reasonings adduced in this chapter, all the manifestations of the faculties of the mind depend on the organization. In order to support this assertion, it has been demonstrated that the manifestations differ according to the sex;—that they are modified in every individual;—and that they do neither appear nor disappear simultaneously:—it has besides been shown that sometimes one faculty manifests itself weakly, while the other faculties are very energetic, and that sometimes one faculty is very energetic, while the others are very defective. Moreover, it has been observed that children inherit the moral character and intellectual faculties of their parents, when a corresponding organization is propagated from parents to children. This doctrine has also been proved by the state of watching, sleeping and dreaming; by the possibility of education; and by the observation that every thing that changes, weakens, or excites the organization, especially of the nervous system, changes the manifestations of animal life. Finally, the proportion between the manifestations and the respective organs does not permit us to doubt the dependance of the moral sentiments and intellectual faculties on the organization.

CHAPTER III.

INNATENESS OF THE FACULTIES OF MAN.

ANOTHER highly important question in psychology is, whence has man his faculties? Is man born indifferent to all action; or does he come into the world endowed with determinate faculties? Now it will certainly be granted that the faculties of automatic life, being considered as effects of the organization, must be innate, because the organization itself is innate; and all the faculties also which are common to man and animals must be innate in man as well as in animals. In general, man participating in the nature of all other beings—of minerals, plants and animals, and being therefore, as some have termed it, a microcosm, must possess all the properties common to him and other beings. Thus as the body of man consists of matter, it is subjected to all the laws of matter. It is attracted towards the centre of the earth, and if it be not supported, falls as inanimate bodies do. It has extension and figure; it possesses all other physical and chemical qualities; and in order to explain many of the functions of man, it is necessary to know the laws of physics, mechanics and chemistry. Moreover, the organic life of man, and that of plants, is supported by the same means, namely, by the influence of caloric, air, light, food &c. Plants also are produced from

germs, which formerly made part of a similar being; they take food, convert it into their proper substance, increase, decrease, and die; and this comparison of man with plants holds true not only in respect to the healthy state, but even to the state of disease. It is certain that various diseases in man are explicable according to certain laws of nutrition, which are observed in plants: if too much food be given to a peach-tree, its bark bursts, grows rough, and secretes gum; and in the same manner, a person who lives on high and stimulating food, has a red countenance, pimples, boils, and various eruptions on the skin. Wounds heal in man as in plants; for if the bark of a branch be stripped off it falls down, just as does a bone deprived of its periosteum. A smooth circular cut, in plants as in man, heals sooner and better than a lacerated wound. The healing or wounds begins from the margin both in man and in plants, &c. In the same way all the organic laws of animals are preserved in man; and the constituent parts of animals are much more analogous, than the parts of plants, to those of man. Their bones, muscles, viscera, arteries, veins and nerves, perform the same functions. Hence, all the faculties of man, which contribute to the production and reproduction of the organization, namely, all the faculties of automatic or organic life, are innate.

In former times there were philosophers who thought that the soul forms its own body; but, if this were the case, an ill formed body never could be endowed with an amiable soul. All the natural

influence of generation, nutrition, climate, education, &c. would also be thereby inexplicable. Hence, it is much more reasonable to think that the soul, in this life, is merely confined in the body, and makes use of its respective instruments, which entirely depend on the laws of the organization. In blindness, the soul is not mutilated, but it cannot perceive light without eyes, &c.

Let us now examine whether the faculties of animal life, *viz.* those which act consciously, are also innate? These faculties may be subdivided into four orders: into voluntary motion; into those of the five external senses; into propensities and sentiments; and into the faculties of the understanding. Now according to the principle above mentioned, that when animal life presents any point of contact between man and animals these common faculties are innate, it is evident that voluntary motion must be considered as innate or given by nature. The functions of the five external senses are also inherent in the nature of man and animals; and these senses exert essentially the same functions in both. No one will attempt to prove that the five senses are the production of our will: their laws are determined by nature. Hence as soon as an animal meets with its destined food, its smell and taste instantly declare in favour of it; and thus it is not astonishing that a kid, taken from the uterus of its mother, preferred broom-tops to other vegetables which were presented to it: Richerand is consequently wrong in saying, " If such a fact have any reality, we should be forced to admit that an animal

may possess a foreknowledge of what is proper for it; and that, independently of any impressions which may be afterwards received by the senses, it is capable, from the moment of birth, of choosing; that is, of comparing and judging of what is presented to it." The hog likewise eats the acorn the first time he finds it. Animals however have, on that account, no need of any previous exercise, of any innate idea, of any comparison or reflexion. The relations between the external world and the five senses are determined by creation. We cannot see as red that which is yellow, nor as great that which is little, &c. But animals can have no idea of what they have not felt.

From these considerations it results, that the comparison of man with other beings (and that not merely with animals, but also with plants and minerals) must be admitted, and cannot be repugnant to our feelings, because we participate of their properties. He, who imagines that such comparisons degrade mankind, should be aware that the greatest natural philosophers, moralists and divines, have maintained the same opinion; as St. Gregorius Nyssenus, St. Augustin, Bonnet, Pascal, Condillac and others. Herder was therefore right in saying, "it is incontestable that all living beings are created conformably to certain laws of analogy." * It is only to be considered that the inferior properties are preserved in the beings of a higher order, modi-

* Ideen zur Geschichte der Philosophie der Menschheit, tom. ii. p. 126.

fied only by superior faculties. In this manner, man unites all physical, chemical, vegetable and animal laws; and it is only by peculiar faculties that he acquires the character of humanity.

I have still to examine the origin of the propensities, sentiments and intellectual faculties. There are three modes of explaining this matter: Man and animals acquire their propensities, sentiments and intellectual faculties, either by external impressions, or by internal causes; and in this latter respect, either one or several general faculties produce all particular faculties; or each special faculty is determinate, and given by creation. I shall first demonstrate that external influences are not the cause of the internal faculties of the mind.

SECTION I.

On external Influences considered as the Cause of the Faculties of the Mind.

EXTERNAL CIRCUMSTANCES.

There are a great number of authors who maintain that the faculties of the mind, instead of being innate, result from external circumstances and accidental events. "Demosthenes," says Helvetius, "became eloquent because he heard Callistratus speak, whose eloquence made so deep an impression upon his mind that he aspired only to his talent." According to the same author, "Vaucanson became

famous in mechanics, because, when yet a child and being obliged to stay alone in the waiting-room of his mother's confessor, he found there a clock, examined its wheels, and by means of a bad knife endeavoured to make a similar machine of wood. He succeeded, and therefore he constructed such surprising machines as his automatons. Milton would not have composed his poem of Paradise Lost, had he not lost his place of secretary to Cromwell. Shakspeare composed his tragedies because he was an actor; and he became an actor because he was forced to leave his native county on account of some juvenile errors. Corneille fell in love and made verses for the object of his passion, and therefore he became famous in poetry. Newton saw an apple falling, and this fall revealed to him the law of gravitation. It is daily observed that revolutions produce great men, &c."

By this manner of reasoning the origin of the faculties is confounded either with the opportunity necessary for their activity, or with some external excitement. It is indeed certain that external circumstances must be presented, otherwise internal faculties cannot act; but opportunities do not produce faculties. Without food I cannot eat; but I am not hungry because there is food. A dog cannot hunt if it be shut up; but its desire of hunting is not produced by leading it into the fields. The same circumstances are often presented to many millions; and perhaps one single individual alone makes use of them. Revolutions make great men known, not because they produce the faculties, but

because they offer opportunities and subjects necessary to the faculties. Circumstances are often very favourable to the attainment of distinction and the acquisition of celebrity; but we do not see that every individual attains an honourable place. It is certainly not sufficient to be an actor in order to compose such tragedies as those of Shakspeare. How many children are exposed to the same influences without manifesting the same energy of faculties; while on the contrary, some individuals not only make use of the present circumstances, but prepare and produce events which admit a still greater activity of their faculties.

On the other hand, it is true that our faculties are often excited by external events, and that without this external excitement they would remain inactive. However useful therefore may be the consideration of great models, I am still convinced that in every science, in every art, in every occupation, the principles of each are easily conceived by those who in a high degree possess the corresponding faculties. This is the case even with moral principles and with religion, which are easily excited if the innate dispositions be conformable.

SOCIETY.

Many works treat of the natural state of man in opposition to his state of society; and they consider many qualities which are deemed results of social life. According to this hypothesis, man is made for solitude; the social state is in opposition to his

nature; and many of his virtues and vices would never have existed, had he not abandoned his natural state of isolation. Excepting certain idiots, however, where, and at what time, has man lived a solitary being? According to history, man lived always in society, at least in families; and these families, though scattered in woods, yet formed communities. As then we find mankind every where united in society, is it not natural to conclude that man is a social being? It is necessary to recollect that, in this respect, there are two classes of animals: several species are destined to live in society, as monkeys, dogs, sheep, hogs, geese, crows &c.; and others to live solitary, as the fox, hare, magpie &c. Man belongs to the social class. Now it is certainly conceivable that the social animals are endowed with faculties destined for society, and that these faculties can never act without society. In reality, every individual is upon the whole calculated for society, and all his faculties must be appropriated to this end. Bustards and cranes place sentinels; a flock of wild geese form a triangle in flying; a flock of chamois is led by a female; honey-bees act in concert &c.: and all these properties are given to animals at the same time with the social instinct. Consequently society itself is a natural institution established by creation, and the faculties, which are observed in social animals, are not at all the result of society. This assertion is also proved by the observation that social animals have quite different, and sometimes even opposite faculties; but if society produced any number of the faculties of man

and animals, every kind of social animal ought to possess them.

WANTS.

Wants, that is, disagreeable impressions, painful situations, poverty and misery, are often considered as the source of the instincts, propensities, sentiments, and intellectual faculties of man and animals. It is certain that in this signification, external wants excite the internal faculties, but it is not true that these external wants produce them. For, according to this supposition, the same external wants ought to produce the same faculties in animals and in man: but we observe that not merely every kind of animal, but even every individual, acts and conducts itself differently against external impressions, and always according to its internal faculties. The partridge dies from hunger and cold during sharp winters, and benumbed sparrows fall from the top of the house, while the nightingale and quail have gone into temperate climates before the season of hunger and thirst has arrived. The cuckoo wants a nest to lay its eggs in as well as the wagtail or the redbreast, and yet it builds none. The idiot makes no effort in order to prevent the injuries of the air and to preserve himself, while the reasonable man covers himself with clothing.—Moreover, the faculties are active in animals and man without any external necessity. The beaver, although shut up and defended against the injuries of the weather, builds its cottage; and the weaver bird, though in a cage, makes its tissue. It consequently follows that external

wants only excite the activity of the internal faculties, but do not produce them; and in this respect their influence is important. The faculties of poor persons, for instance, are more active than the faculties of those who live in plenty; but when the faculties have not been given by nature, external wants cannot excite them.

The expression *want* has still another sense, that of propensity or inclination. Want, in this signification, is evidently the effect and not the cause of the internal faculties; and, in this sense, there are as many wants as there are different faculties themselves. These wants are also proportionate to the activity of the faculties.

CLIMATE AND MODE OF LIVING.

Several philosophers have advanced that climate, manner of living, and even the nurse's milk, might be the cause of our faculties; and according to this manner of thinking, the modifications of our faculties are confounded with their primitive origin. These external influences, however, can neither produce nor annihilate determinate faculties: the special faculties are given by creation. This opinion must nevertheless be considered. The arguments adduced in support of it only prove that the manifestations of our faculties depend on our organization; for climate, eating, drinking &c. have a powerful influence over the organization. Instead therefore of denying the influence of climate, food, air, light &c. we consider it as very important, yet

only in respect to the activity of the faculties. The milk of nurses contributes certainly to the increase and organic constitution of children, and consequently to the manifestations of the moral and intellectual faculties, in as far as the body is necessary to these manifestations; but all these external influences cannot produce any faculty. If parents were right in attributing the inferior propensities of their children to nourishment, why might not grown-up persons, who live upon beef, veal, mutton, pork &c. accuse the ox, the calf, the sheep, or the pig, for their own want of intelligence, and for their peculiar character? Dietetics must no doubt be still improved; for they ought to determine the influence of external impressions upon the organization, according to the different constitutions or temperaments, which it affects; and they ought to point out what external influences—what food, climate &c. act more upon the nervous than upon other systems. The activity of our faculties varies according to the modifications of the organization, in the same way that the milk and butter of cows vary according to the food they live on; or as the flesh and fat of animals are modified according to the food by means of which they are fattened. The activity of men fed on game differs much from that of those who live upon potatoes and vegetables; and it seems possible to show the greater influence of different aliments upon certain systems in the healthy state, just as we may show that some medicaments act more upon one system than upon another. By the same reason we may also conceive

why certain rules of fasting are useful in order to subdue the sensual appetites. Certain degrees of excitement suppress the activity of certain faculties while they increase that of others.

Climate has certainly great influence upon the organization; and it seems natural to suppose that certain climates contribute more than others to the developement of certain faculties. Their influence, however, is not so powerful in mankind as in animals; for man by his intellectual faculties opposes its influence. Of this the Jews are an evident proof. This people is dispersed over the whole world, and though they are somewhat modified in different countries, yet their primitive and characteristic organization is every where preserved. The effect of innateness and propagation from parents to children is much stronger than that of external influence. In determining therefore, that, according to climate and nourishment, the faculties are more or less active, the primitive origin of the faculties, and their greater or less activity, must not be confounded.

EDUCATION IN GENERAL.

Finally, education has been particularly considered as a cause of the faculties of the mind. According to this opinion, the minds not only of men but also of animals are born without determinate faculties—indifferent—as tabulæ rasæ or blank paper; and all the instincts and aptitudes of animals, from the insect to the dog and the elephant, are the effects of instruction. Thus foxes hunt because they learn

it from their parents; birds learn to sing; and man becomes man by education. It must be answered that neither in animals nor in man does education produce any faculty whatever.

CONSTANCY OF ANIMALS AND MEN.

If animals be susceptible of all impressions around them, so that these impressions determine their character and nature, why does every kind of animal always preserve the same nature? Why do birds hatched by those of different species imitate the habits and instincts of their parents? Why does not the hen learn to coo when she is brought up with pigeons? Why does the young duck, hatched by a hen, run towards the water? Why does not the cuckoo sing like the bird that hatched and nourished it? Why does not the female nightingale learn to sing like the male? When young squirrels and rabbits are pursued, why do squirrels climb upon trees, while the rabbits hide themselves in burrows? Why are dogs attached to their masters notwithstanding the blows they receive, and which ought to produce the contrary effect? &c. It is true that the actions of animals are not confined solely to what their preservation requires. They are susceptible of several modifications: they modify their manners according to the situation wherein they live; and they are susceptible of an education beyond their wants. Hence monkeys, dogs, cats, rats, horses, harts &c. can be instructed to play various tricks. Still however this power of modifying their manners is not

unbounded, but conformable to their nature; for pigeons and roes never can be made to hunt like falcons and dogs.

It is the same with man. If human faculties be the result of external influences and education, why does not man obtain the nature of various animals? Why does he at all times and in all climates, preserve his characteristic nature, and his primitive qualities? Young children pass the most of their time with their mothers and nurses, and consequently with women; yet boys and girls show, from the earliest infancy, their distinctive character, and this difference between the sexes *continues for life.

GENIUSES AMONG ANIMALS AND MEN.

If animals and men learn all their functions from other individuals, why do several individuals excel others which have absolutely the same manner of living, and the same instruction? Why does one nightingale sing better and more constantly than another which lives in the same wood? Why, amongst a drove of cows, oxen, or horses, is one individual good-natured and meek, and another ill-natured and furious? M. Dupont de Nemours had a cow which alone understood to open the enclosure of a field; and none of its companions learned to imitate its manner of proceeding; but, if near the entrance, they waited with impatience for the arrival of their leader. A hunting dog, when hindered from taking a comfortable place near the fire, by his companions occupying every surrounding situation,

* continues

went out into the yard and barked; immediately all the other dogs did the same; and then he ran in and took the best place near the fire: though he thus often deceived his companions, yet none of them was capable of imitating his stratagem. A little dog, when eating with several large dogs, conducted himself in the same manner, in order to secure his portion, or to catch some good bits. Such genius is not the result of instruction.

Children sometimes show particular dispositions and faculties before they have received any kind of instruction; and almost every great man has shown in his infancy the character of future greatness. Achilles, hidden in Pyrrha's clothes, took the sword from among the presents of Ulysses. Themistocles, when still a child, said that he knew how to increase a state and render it powerful. Alexander would not dispute any prize at the Olympic games, unless his rivals were kings. At fourteen years of age, Cato of Utica manifested the greatest aversion from tyranny. Nero was cruel from the cradle. Pascal, when twelve years old, published his treatise on conic sections. Voltaire made verses when only seven years of age. The number of such examples is very great; and it is unnecessary to multiply them, as they must be within the scope of every one's knowledge.

INDIVIDUALITY.

All individual animals of the same kind present to us, in their talents, something particular: every young bird of the same brood does not learn to sing

with the same facility; one horse is more fit for the race than another; and sportsmen know very well that there is a great difference among dogs, &c. It is the same with mankind: children of the same parents are entirely different, though their education is uniform. How is it possible that the same education should produce all the particularities of different children. I shall afterwards prove that education has a great influence upon the majority of persons whose faculties are middling, who have no determinate vocation, and who repeat what they hear, and do what they see done by others; yet notwithstanding the same education, every individual preserves some peculiarity in his character, in his manner of feeling and thinking: so many men, so many minds. Moreover, if education could produce faculties, why have instructors not yet found the means of conferring understanding, judgment and good qualities in general? Why are we not all men of genius? Why cannot moral and satirical discourses prevent the abuses of our faculties? Why are we obliged to lament so many errors and crimes?

Objection.

In order to prove that man acquires all his moral and intellectual faculties by education, it is asserted that savages who are found in woods, destitute of all human faculties, resemble beasts solely because they have not received any education; but this objection is refuted, as soon as the condition and state of these pretended savages are known. These

unfortunate creatures may be referred to two classes: ordinarily they are wretched persons of a defective organization, with heads too large, being increased in size by dropsy of the brain; and when this is not the case they have heads too small and deformed. These individuals have almost always scrofula, hanging lips, a thick tongue, a swollen neck, a bad constitution in general, a wavering and unsteady gait: they are more or less completely idiots; and generally consist of persons who have been exposed and given up to the care of Providence, because they were burdensome to their parents. In certain countries, the lower classes of people consider such unhappy creatures as bewitched, and take no care of them; and often these idiots have a determinate propensity to live alone in woods, and they consequently escape. At Haina near Marbourg, where there is a great hospital, we were told that several idiots had escaped, and on sending people in order to seek and catch them, other idiots who had escaped from other places were found. In a castle near Augsburgh, we saw a mad woman who had been found in a wood. At Brunswick, we saw a woman, who was found lying on her side in a forest, but was incapable of pronouncing a single word. The pretended savage of Aveyron, who is kept in the Institution of the Deaf and Dumb at Paris, is an idiot in a high degree: his forehead is very small and much compressed in the superior region; his eyes are little, and lay deep in the orbits; and we could not convince ourselves that he hears, for it was impossible to make him attentive to our calling

him, or to the sound of a glass struck behind him! His attitude and manner of sitting are decent, though his head and body are incessantly in motion from side to side; he knows several written signs and words, and points out the objects noted by them; and the most remarkable instinct in him is, the love of order; for as soon as any object is displaced, he replaces it.

Such unfortunate creatures therefore are idiots, not because they have received no education, but because on account of their imbecility they cannot be educated. It is indeed difficult to conceive that in our populous countries, a well organized person should long wander about like a savage, without being discovered. Yet, if such an individual, who has escaped in infancy, be discovered in a forest, though he cannot be acquainted with our manners and determinate education, he will manifest the essential and characteristic faculties of mankind; and, living in society, will soon imitate the manners and receive the instruction of others. The girl of Champaigne proves this assertion.

Thus education produces no faculty either in man or in animals: but, I repeat it, let us not draw the conclusion, that education is superfluous. I shall in the sequel examine what education does; and shall prove its importance. It is, however, certain that education cannot produce any faculty: it only excites, exercises, guides and determines the uses, and prevents the abuses of the different faculties; and in this respect, it is of the highest importance. This is illustrated in countrymen and peasants, who

are confined to their occupations: they are ignorant; yet some of them surpass many citizens in every kind of aptness, and would do so in science, had they received a good education.

From all these considerations relative to external influence, it results that the internal faculties are not produced by them, but that the doctrine of external impressions as causing the faculties of the mind, may be reduced to two propositions:—Either the external impressions present some opportunity for the activity of the faculties; or they excite and guide the faculties; but in no way do they produce them.

SECTION II.

ON GENERAL FACULTIES CONSIDERED AS THE CAUSE OF THE SPECIAL FACULTIES OF THE MIND.

The second mode of explaining the origin of the faculties of man and animals is to admit an internal cause. The meaning however of those authors who do so must be subdivided, because several authors admit one or more primitive faculties, which they say produce all the special faculties, while others maintain that every special faculty is innate. Let us first consider the doctrine, that one or several general faculties produce all other special faculties.

ATTENTION.

Attention is commonly considered as the cause of all internal faculties; and Helvetius has even

said, that each well organized person might exercise his faculties by means of his attention, with such success, as to arrive to the first rank in talent. Now by the expression, well organized persons, can only be understood such as are not born idiots; and consequently according to this opinion, the first and most important faculty, *viz.* attention, on which all other faculties depend, depends itself on organization.

The word attention has two acceptations. It, in the first place, denotes consciousness in general, and in this sense attention accompanies the activity of every faculty. Hence may it be explained why one animal or man pays great attention to one object, and very little or none to another. Hence sheep will never pay attention to philosophy nor theology: and while the squirrel and pigeon perceive a hare pass with indifference, the fox and eagle watch for it. Different individuals are attentive to different objects, even according to their sex and age; for among children, girls prefer dolls, ribands &c., while boys take horses, whips and drums; and among adults, one is pleased with philosophical discourses, and another with witty replies; one with events which touch the heart, and another with sanguinary battles. Attention in this sense is also proportionate to the activity of the respective faculty; and therefore if the five senses be not exercised, much greater impressions are necessary to excite their attention. The attention of every faculty may be cultivated and improved by its exercise; but by one particular faculty general attention cannot be exercised.

Attention denotes also a distinct consciousness, a reflection on our sensations and actions. The aptitudes and instincts of animals, however, are certainly not the effect of this kind of attention; for no one will maintain, that the rabbit, badger, mole, marmot, or hamster, make burrows because they have examined with attention the advantages of them; or that the beaver builds a cottage because it has studied the laws of mechanics. Among men, geniuses burst forth inconscious of their talent. This kind of attention may excite the particular faculties, but it never produces them. Attention, correctly speaking, is the result of the action of every faculty, therefore attention is as manifold as the faculties themselves.

PAIN AND PLEASURE.

There is an ancient doctrine which teaches that pain and pleasure, desire and aversion, are not only the source of all actions, but also of all faculties: let us briefly examine it. Pain and pleasure, desire and aversion, are general expressions, and belong to all the faculties. Every faculty, being active, desires; and man and animals desire the objects relative to their faculties. The dog has the desire of hunting, the beaver that of building. Hence the desires are as different as the faculties; and the energy and number of desires are proportionate to the activity and number of the faculties. It is the same with pain and pleasure. Every faculty being satisfied receives pleasure; and every faculty being

disagreeably affected feels pain: consequently the kinds of pain and pleasure are also as numerous as the faculties. Hence one individual delights in generously pardoning offences, and another in taking revenge: one is happy in the possession of riches, and another glories in disdaining the vanity of mankind. It follows that pain and pleasure are the result, and not the cause, of the particular faculties.

PASSIONS.

Helvetius and several others consider the passions, principally the love of glory or ambition, as the source of the faculties: let us examine their doctrine. The expression, *passion*, has different significations: sometimes passion is confounded with the affections in general; sometimes it signifies the highest degree of activity, and sometimes it denotes any special faculty. Passions in the sense of affections, as anger, envy, shame, affliction, joy &c. are only modifications of the sensations, and cannot produce the faculties whose modified actions they are. Passions, as the highest degree of activity of any faculty, produce evidently great phenomena; for every faculty which is extremely active, whether by its own power and internal energy, or by external excitement, may perform actions which are impossible in the ordinary state of activity; but it is also evident, that the faculties are not the effect, but the cause of the passions. Finally, passions as particular faculties, for example, love, glory, pride &c. may excite the other faculties, but they never

can produce them: thus many individuals have emulation, but they do not therefore excel in any particular talent. This point will be better understood when I speak of the mutual influence of the faculties. Here however I may make two secondary observations in respect to the passions; first, then, the factitious passions spoken of in various books do not exist; and, secondly, all faculties are innate: their highest degree of activity ought to be called passion; and as every passion presupposes a primitive faculty, therefore the passions are as different as the faculties.

Locke and many modern writers maintain that children are destitute of passions; and it is true that there is in adults one passion which is not observed in children, the passion of love. There have been, however, some individuals who at three or four years of age have felt passionately this propensity; and in general the greater number of inclinations manifest themselves with energetic activity in children. The opponents of our doctrine, for the most part, confound the objects upon which the particular faculties act at different ages, with the inclinations themselves. Children, it is true, have no inclination to defraud the orphan of his inheritance, or to conquer kingdoms; but they sometimes deceive one another for a bird's-nest; they fight for play-things, and they are proud to occupy the first place at school: young boys are even more grieved by the loss of a bird, than when grown up they are by that of a horse. Some qualities are even more active in children than in adults, while other facul-

ties are more energetic in adults than in children. Hence passion, in the signification of the highest degree of activity, in general takes place in children; and very few faculties are quite inactive in them. This is also the case with other faculties in adults. Thus it is necessary to speak more precisely, and to indicate the faculties which do not act passionately at different ages; but it is false to say generally, that children have no passions. Children have also passions in the sense of affections; for who has not observed in them anger, jealousy, envy, shame, affliction, joy &c. Hence, children have passions as well as adults.

From these considerations, it results that one or several general faculties, or even modes of their action, are not sufficient to produce all particular faculties. Thus from all preceding negative proofs we may conclude, that every special faculty of the mind is innate, and given by creation. There are also many positive and direct proofs of the innateness of every faculty.

SECTION III.

INNATENESS OF THE SPECIAL FACULTIES OF THE MIND.

Analogy.

The first proof may be drawn from analogy. By examining nature we perceive that every kind of earth, every salt, every metal, has its deter-

minate qualities, by which we are enabled to distinguish one species from another : Thus, the figure of crystallization, the weight, affinity, and other physical and chemical properties, are determinate and permanent. It is the same with plants : their general laws are fixed, and every plant has its own character. A pear-tree never bears apples, nor an apple-tree pears : we never gather figs from a vine, nor grapes from a thorn-bush. The plastic power of vegetables, by which they have their increase, fructification, and all relations to external beings, is also determinate. Every species of animal presents a specific character : the structure of their bodies, and all their manifestations, afford characteristics to distinguish one from another; and we can never change a cat into a dog, nor a tiger into a lamb, &c. Hence we must say with Moses, "God created all beings, earths, plants, fishes, birds, and all animals, each according to its kind."* Why then should man be excepted?

The faculties of man may be divided into those which are common to man and animals, and those which are proper to man. Now as long as we consider faculties which are common to animals and man, it is evident that these faculties are innate ; and it is beyond doubt, that all the instinctive aptitudes and inclinations of animals are innate. Is it not evident that the faculties by which the spider makes its web, the honey-bee its cell, the beaver its hut, the bird its nest, &c. are inherent in the nature

* Gen. i. 22, 24.

of these animals. When the young duck, or tortoise, runs towards the water as soon as hatched; when the bird brushes the worm with his bill; when the monkey, before he eats the may-bug, bites off its head, &c. all these and similar dispositions are conducive to the preservation of animals, but they are by no means acquired. According to the same law, the hamster gathers corn and grains, the dog hides its superfluous food, the falcon kills the hare by driving his beak into its neck, &c.

In the same way, all instinctive manifestations of man must be innate: thus the new-born child sucks the fingers and seeks the breast, as the puppy and calf seek the dug. I have mentioned above, that voluntary motion and the five external senses, common to man and animals, are innate. Moreover if man and animals in common feel certain propensities and sentiments, with clear and distinct consciousness, we must consider these faculties as innate. Thus, if in animals we find examples of mutual inclination between the sexes, of maternal care for the young, of attachment, of mutual assistance, of sociableness, of union for life, of peaceableness, or of desire to fight, of propensity to destroy, of circumspection, of slyness, of love of flattery, of obstinacy, &c. all these faculties must be considered as innate. Let all these faculties be ennobled in man: let the animal instinct of propagation be changed into moral love; the inclination of animals for their young, into the virtue of maternal care for children; animal attachment, into friendship; animal susceptibility of flattery, into love

of glory and ambition; the nightingale's melody, into harmony; the bird's nest, and the beaver's hut, into palaces and temples, &c.: these faculties are still of the same nature, and all these phenomena are produced by faculties common to man and animals. They are only modified and ennobled in man by the influence of superior qualities, which give another direction to the inferior ones.

Many modifications of sentiments, known by the name *affections*, as pain, pleasure, fear, anxiety, anger, envy, jealousy, hatred &c. are common to man and animals, and are not voluntarily produced either by man or by animals; for both are struck with affections before they think of them. These affections even arise against will and reflection, and are inherent in the nature of man and animals. Accordingly when the sentiments and affections are somewhat energetic, they are accompanied with bodily motions, gestures and sounds, which are as involuntary as the affections themselves, but which tend to the preservation of man and animals. Thus the infant, who has no knowledge of motherly care, weeps and cries when he is hungry and in pain; the puppy, though destitute of the sense of hearing during the first fortnight, and unaware of its complaining being heard, whines and invites the assistance of its mother; and when threatened by any danger, we draw back the limbs before we have time to think of it, and of the means to escape. The will has no part in these actions, but man and animals do by innate laws what nature commands them to do.

DIRECT PROOFS OF THE INNATENESS OF THE FACULTIES PROPER TO MAN.

Finally, man is endowed with faculties which are peculiar to him; and here it is to be investigated whether the faculties which distinguish man from animals, and which constitute the human character, are innate. It must be answered, that all the faculties of man are given by creation, and that human nature is as determinate as that of every other being. Thus though we see that *man* compares his sensations and ideas, inquires into the causes of phenomena, draws consequences and discovers laws and general principles; that he measures distances and times, and crosses the sea from one extreme to another; that he acknowledges culpability and worthiness; that he bears a monitor in his own breast, and raises his mind to the idea and adoration of God: —yet all these faculties result neither from accidental influence from without, nor are they produced by his own will from within. How indeed, in the greatest and most important occupations, could the Creator abandon man and consign him to chance? No. Herein, as in all other circumstances, he has prescribed to man his sphere of activity, and guarded all his steps. It is only by these means that the same essential faculties are perpetuated in the human kind, faculties the existence of which we could never have conceived unless nature had conferred them upon us.

Constancy of the human Character.

In order to prove that man does not acquire his faculties by education, I have already mentioned the constancy of the human character; and this constancy really proves the innateness of all the faculties with which man is endowed. Mankind, in as far as we know their history, are ever the same, not only in respect to organic, but also to animal life. Ancient mummies present the same parts of the skeleton which we at present find in man, and the history of all times exhibits virtues and vices essentially the same. Thus mankind have not acquired any faculty, and can never lose any. The special faculties are always the same; and the only difference observed, at different times, is that the manifestations of the special faculties are more or less active, and are variously modified, in different persons. Here one unjustly seizes a piece of ground, there a place of honour; here the person beloved is celebrated on an oaten-reed, there on a harp. Of conquerors, some are decorated with feathers, and others with purple; but all these modifications are grounded upon primitive faculties essentially the same.

Uniformity of Mankind.

The uniformity of mankind in respect to the essential faculties, notwithstanding all the exterior influence of society, climate, modes of living, laws, religion, education and accidental events, affords a great proof that nothing can change the laws of

nature. We every where find the same species; whether man stain his skin or powder his hair; whether he dance to the beating of a drum or to the music of a concert; whether he adore the stars, the sun and the moon, or whether his religion be guided by Christian principles. The special faculties are every where the same.

Geniuses.

I have also spoken of genius, in order to prove that education does not produce our faculties. Indeed children, endowed with particular dispositions, show their peculiar faculties before they have received any kind of instruction. External circumstances are sometimes very adverse to the exercise of genius; but individuals endowed with energy of disposition only wait for opportunities, and often leave their parents and their profession to follow their natural inclination. Moses, David, Tamerlane and Pope Sixtus the Fifth, were originally shepherds; Socrates, Pythagoras, Theophrastus, Demosthenes, Molière and Rousseau, were the sons of artificers. Such individuals are sometimes obliged to surmount great obstacles; but they ultimately vanquish all impediments; their character prevails, and their talents assume their natural place. Sometimes such individuals, prevented by circumstances from following their inclinations, find their favourite occupation, and their most agreeable recreations, in the exercise of their most powerful dispositions. Hence peasants, shepherds and artisans, have be-

come astronomers, poets, philosophers &c.; and on the other hand, ministers, kings and emperors, have been known to employ themselves in the mechanical arts. All this proves that the primitive faculties are innate.

Objection.

It is objected that men of genius form a particular class, and that they cannot be compared with persons whose faculties are middling. This is the same as to say, that hunger and the circulation of the blood do not depend on the organization, because all men have not an immoderate hunger, famine, or fever; or that the mole does not see by means of its eyes, because the stag sees better on account of its larger optic nerves; or that man has no smell, since that of the dog is so superior on account of its larger olfactory nerves. We ought certainly to conclude in a quite opposite manner; for, if the organization be the cause of the highest degree of activity of the different faculties, it is evident that on it the lower degree of their activity also depends.

Particularity of every Genius.

The man of greatest genius in one respect is often very weak in others. William Crotch, at six years of age, astonished all his auditors by his musical talent, but in every other respect he was a child. Cæsar never could have become a Horace or a Virgil, nor Alexander a Homer. Sir Isaac Newton

could not have been changed into so great a poet as he was an astronomer; nor Milton into so great an astronomer as he was a poet. Nay, Michael Angelo could not have composed the paintings of Raphael, nor Albano those of Titian, &c.

Particularity of every Sex.

Both sexes manifest essentially the same moral and intellectual faculties, but there is a great difference between their modifications. Several faculties are more energetic in women, and others more in men. In general, the feelings are stronger in women, and the intellectual faculties more powerful in men. These modifications then are inherent by nature, and it is impossible to change one sex into another.

Individuality of every Person.

In all nations, notwithstanding the uniformity of opinions, customs, professions and arts, sciences, laws, religion, and whatever relates to positive institutions, every individual by means of his peculiar character differs from another. Thus every one has more capacity and a stronger propensity for one than for another object; and every child manifests his own manner of thinking and feeling. It is a fact generally known, that every one excuses his frailties by saying, It is my nature; it is stronger than I am; I cannot help it, &c. Even brothers and sisters often differ extremely from each other, though their

education is uniform. The cause must therefore be internal.

Relation between the Manifestations of the Faculties and their respective Organization.

It is also necessary to admit the innateness of the faculties, because there is a direct relation between the manifestations of the feelings, and of the faculties of the understanding, and their respective organizations.

Man has been created.

Finally, man, like every other being, is considered as created; and it is consequently rational to think that his faculties are determinate, and ordered by creation. We therefore maintain that every faculty of man is innate.

In respect to innateness it is important to consider an observation of Locke. In order to demonstrate that the ideas are not innate, Locke stated that children do not manifest certain qualities, and that different nations have quite different, nay, opposite principles of morality. Now this assertion of Locke, in respect to the innateness of ideas and moral principles, must not be confounded with the innateness of the faculties. No sensation, no idea, no principle, is innate. Our sensations and ideas of external objects result from external impressions; and these impressions are accidental, consequently the ideas of them are not innate. The faculties,

however, which perceive the impressions, and conceive the ideas, are innate. Thus the idea of a stone, plant, or animal, are not innate; but these objects make impressions on our senses, which again produce sensations or ideas in our minds, and both these senses, and the faculties of our mind, are innate. In the same manner the sensations and ideas of external and accidental events are nowise innate; and in general no determinate action of any faculty, but the faculty itself, is innate. The propensity to love, not the subject of love; the faculty of speaking, not the peculiar language; the faculty of comparing and judging, not the determinate judgment; the faculty of poetry, not the particular poem, &c. are innate. Thus there is a great difference between innate faculties, and innate ideas and sensations.

It is true that children do not manifest every faculty; but we cannot from this draw the conclusion that the faculties are not innate. For birds do not make their nests, the hamster and marmot do not collect provisions, the swallow does not migrate into foreign countries, immediately after their birth: neither do animals propagate, or females and women give suck, immediately on coming into the world; yet all these qualities are innate. This difficulty is easily explained. Every faculty is confined to its own organ, and its manifestations are proportionate to the developement of the organ. Now several organs are very little developed in children, but very greatly in adults; while others are proportionally larger in children than in grown-up persons;

and some are greatly developed in children as well as in adults. The manifestations of the faculties, then, being always proportionate to the developement of the organs, it is evident why certain faculties do nbt manifest themselves in infancy.

It is also obvious why the moral principles are different in different nations. We agree with Locke that these principles are not innate; but we maintain that the faculties which form these principles are innate. I shall afterwards show that certain faculties alone make laws, and that the moral principles vary in different nations because the principles do not result from one organ but from the different combinations of various organs; and hence it follows that the justice of a libertine without benevolence and veneration must be quite different from that of a charitable and modest person without the love of venery. We every where see the same fundamental faculties, but the manifestations are greatly modified. Men every where adore a Supreme Being; they every where have marks of honour and of infamy; there are every where masters and servants; all nations make war, whether with spears and arrows, or with muskets and artillery; and every where dead friends are lamented, whether their remembrance be honoured by embalming their bodies, or by putting their ashes into an urn, or by depositing them in sepulchres. Hence though the functions in general of all faculties are modified in different nations, and consequently also the functions of those faculties which determine all laws and principles, yet the same primitive faculties are ob-

served in the customs, manners and laws of all nations.

The innateness of the faculties is too evident to escape the penetration of profound thinkers; and many ancient and modern philosophers, both profane and religious, were convinced of this. Plato (in his Republic VI.) considers philosophical and mathematical talents, memory, the sentiments of pride, ambition, courage, sensuality &c., as innate. Hippocrates, in treating of the qualities necessary for a physician, speaks of natural and innate dispositions. Quintilian says, If precepts could produce eloquence, who would not be eloquent? Cicero, Seneca &c. were of opinion that religion is innate; and so also thought Lavater. Herder * considered the sociability of man, his benevolence, his inclination to venerate a superior being, his love of religion, &c. as innate. Condillac † says, "Man does not know what he can do, till experience has shown what he is capable of doing by the force of nature alone; therefore he never does any thing purposely till he has once done it instinctively. I think this observation will be found to be permanent and general; and if it had been well considered, philosophers would have reasoned better than they have done. Man makes analyses only after having observed that he has analyzed; and constructs a language after having observed that he had been understood. In the same manner poets and orators began before they thought of their peculiar talents. In one word,

* Th. 1. S. 252.

† Œuv. Compl. 8vo. tom. iii. p. 115.

all that man does he did at first from nature alone: nature commences, and always commences well. This is a truth that cannot be repeated too frequently."

"When the laws," says he in another passage,* "are conventions, they are arbitrary. This may be the case; and indeed there are too many arbitrary laws; but those which determine the morality of our actions cannot be arbitrary. They are our work as far as they are our conventions; but we did not make them alone: nature dictated them to us; and it was not in our power to make them otherwise than they are. The wants and faculties of man being given, laws are given also; and, though we make them, God, who created us with such wants and such faculties, is in fact our sole legislator. In following these laws conformably to nature we obey God; and this is the completion of the morality of our actions."

Innateness was so evident to ancient philosophers that they thought that even sensations and ideas were *innate*. I have mentioned above that this assertion is incorrect, and that only the faculties of acquiring these sensations and ideas are innate. Christianity also admits the innateness of the faculties; for according to it all is given from above. "A man can receive nothing, except it be given to him from heaven." †—"No man can come unto me, except it were given to him of my Father." ‡—"The disciples said, Why speakest thou in parables?

* Loc. cit. p. 55. † John iii. 27. ‡ John vi. 65.

Christ answered, Because it is given unto you to know the mysteries of the kingdom of heaven, but to them it is not given." *—" St. Paul says: " When the Gentiles which have not the law do by nature the things contained in the law, these, having not the law, are a law unto themselves: which show the work of the law written in their hearts, their conscience also bearing witness, and their thoughts the mean while accusing, or else excusing one another." †

RECAPITULATION.

I consider as the basis of anthropology this truth, that the nature of man is determinate, and that all his faculties are innate. With this view, I have first refuted all opinions, according to which the faculties of man and animals originate from external impressions, or from certain particular faculties which are said to produce all special faculties. I have next mentioned direct proofs, as the analogy throughout all nature: minerals, plants and animals, have their peculiar and determinate nature, and why should not man? In conformity with this consideration, I have demonstrated that the faculties which are common to man with minerals, plants and animals in general, must be innate in man as well as in other beings. Moreover, I have proved the innateness of the merely human faculties by the constancy of the human character; by the uniformity of the nature of man at all times and in all countries; by the

* Matt. xiii. 10, 11.

† Rom. ii. 14, 15.

tendency of natural genius; by the peculiarity of every genius; by the determinate character of each of the sexes; by the peculiarities of every individual; by the relation between the organization and the manifestations of the respective faculties; and finally, by the circumstance that man is a created being. As long therefore as all these proofs are unrefuted, this principle of anthropology stands unshaken.

CHAPTER IV.

ARE TRUTH AND THE KNOWLEDGE OF NATURE DANGEROUS, OR IN OPPOSITION, TO MORALITY AND RELIGION?

IT is my intention to show, that "there is a much more exact correspondence between the natural and moral world than we are apt to take notice of."*—It is proved by incontestable facts, that the feelings and intellectual faculties are inherent in the nature of man, and that their manifestations depend on the organization; but ignorance often, and hypocrisy and envy sometimes, take part in the discussion. The basis of the doctrine is no longer attacked: it seems more convenient to blame its consequences; and, without knowing why or explaining how, to cry out that it is dangerous. This, in all ages, has been the reception of every discovery and invention. The disciples of the various philosophical schools of Greece inveighed against each other, and made reciprocal accusations of impiety and perjury. The people, in their turn, detested the philosophers, and accused those who investigated the causes of things of presumptuously invading the rights of the Divinity. Pythagoras was driven from Athens on account of his novel opinions; and for the same reason Anaxagoras was confined in prison: Democritus was treated as a fool by the Abderites for

* Bishop Butler, Sermon VI.

endeavouring to find out the cause of madness by dissections; and Socrates, for having demonstrated the unity of God, was forced to drink the juice of hemlock. Several of those who excelled in physics in the fourteenth century were punished with death as sorcerers or magicians. Galileo, when seventy years of age, was shut up in prison for having proved the motion of the earth. Vesalius, Varolius and Harvey, were persecuted on account of their discoveries. Those who maintained, at first, the influence of climate upon the intellectual faculties of man were suspected of materialism. The pious philosopher Bonnet, Linnæus, Buffon, the virtuous Lavater and many others, have been treated as materialists and fatalists.

The example of Aristotle and Descartes may be quoted to show the good and bad fortune of new doctrines. The ancient antagonists of Aristotle caused his books to be burned; and, in the time of Francis I. the writings of Ramus against Aristotle were similarly destroyed, his adversaries were declared heretics, and under pain of being sent to the galleys philosophers were prohibited from combating his opinions. At the present time, the philosophy of Aristotle is no longer spoken of.—Descartes was persecuted for teaching the doctrine of innate ideas; he was accused of atheism though he had written on the existence of God; and his books were burnt by order of the university of Paris. A short time after, the same university adopted the doctrine of innate ideas; and when Locke and Condillac attacked it, there was a general cry of materialism and fatalism.

Thus the same opinions were considered at one time as dangerous because they were new, and at another as useful because they were ancient. What is to be inferred from this but that man deserves pity; that the opinions of contemporaries, in respect to the truth or falsehood, and the good or bad consequences imputed to a new doctrine, are altogether suspicious; and that the only object of an author ought to be that of pointing out the truth. Ancillon is therefore right in saying with Bonnet, Reason does not know any useless or dangerous truth. That which is, is. This is the only answer to be given to those who, valuing things only by the advantage they may produce, incessantly ask, *Cui bono—what is this good for?* and at the same time to those who anxiously ask, *To what does this lead?* Jesus the son of Sirach long ago said, "We ought not to demand, what is this good for; the usefulness of every thing will be known in its due time."

We are far from thinking that ignorance and knavery will not attack our doctrine with abuse: but what does not man abuse? Tell him that he ought to expiate his crimes; and in his superstition he will immolate his children. Have not Lucretius and his disciples employed all their genius and talents to demonstrate, that the belief in the immortality of the soul maintains the fear of death, and poisons all the enjoyments of life; whereas Christians consider this belief as the basis of order and happiness, of morality and of the most efficacious comfort during the calamities of life! To

establish hospitals for inoculation or for vaccination, and to fix upon edifices a conductor for lightning, is, in the opinion of some persons, of the greatest service to humanity; but, in the eyes of others, it is an offence to Divine Providence. In one word, man finds in all things some cause of complaint; and we can only say with St. Bernard, "we ought to judge in a different manner the complaints of the ignorant and those of the hypocritical. The former complain from ignorance, the latter from malice; the first because they do not know the truth, the second because they hate it."

Malebranche has very well painted the enemies of new truths. "Persons of solid and true piety," says he, "do not condemn what they do not understand; but the ignorant, the superstitious and hypocritical, do. The superstitious by a slavish fear become fierce, when they see an ingenious and penetrating man. If he assign the natural cause of thunder and its effects, they deem him an atheist. Hypocrites on the contrary, though led by particular motives, make use of truths generally venerated; and they combat new truths under the mask of some other truth: sometimes they deride secretly what every one respects, and produce in the minds of others a reputation which is the more to be feared, in proportion as the things which they abuse are more sacred."

As we maintain, that the manifestations of the mind depend on the organization, it is objected that thereby materialism is established; and as we show

that the faculties of the mind are inherent in the nature of man, it is said that this doctrine leads to fatalism.

The object, then, of this chapter may be divided into three sections. In the first of them, I shall answer the objection of materialism; in the second, I shall treat of fatalism; and in the third, of moral liberty.

SECTION I.

MATERIALISM.

It is said that, if the manifestations of the faculties of the mind depend on the organization, materialism will thereby be established. It is to be observed that the expression materialism has two different significations. One class of materialists maintain, that there is no Creator; that matter has always existed; and that all the phenomena of the world are the effects of matter. The ancient Roman church attached this signification to the expression materialism; and it is often the case at the present day, that materialism is employed as synonymous with atheism. Our assertion, however, that the manifestations of the mind depend on the organization, is far from this sort of materialism. A natural philosopher, who inquires into the laws of phenomena, cannot be an atheist: he cannot consider the admirable and wise concatenation of all nature, the mutual relation between all things, as destitute of a primitive cause. He is obliged, according to the

laws of thought, to admit such a cause, a supreme understanding, an all-wise Creator.

Another kind of materialism is taught by those who admit a Creator, but who maintain, that man does not consist of two different substances—the body and soul, and that all the phenomena, ordinarily attributed to the soul, result only from the forms and the combinations of matter. The soul, in their opinion, is a fluid of extreme tenuity, distributed over all things, and enlivening the whole organization. Our doctrine of the physiology of the brain and nervous system has nothing in common with this opinion: we never endeavour to explain final causes; but have always declared, and every where do declare, that we make no inquiry into the nature of the soul, nor into that of the body: we are led only by experiment. Now we have seen that every faculty manifests itself by means of the organization:—but, when our antagonists maintain that we are materialists, they ought to prove that we teach that there is nothing but matter. The falsehood of their accusation is rendered very obvious by the following considerations. The expression *organ* designates an instrument by means of which some faculty manifests itself: the muscles, for example, are the organs of voluntary motion, but the muscles are not the moving power; the eyes are the organ of sight, but the eyes are not the faculty of seeing. We separate the faculties of the soul or of the mind from the organs, and we consider the cerebral parts as the organs of these faculties, *viz.* as the instruments by means of which these faculties manifest

themselves. Now even the adversaries of our doctrine must so far admit the dependence of the soul on the body. Professor Walter, of Berlin, imputed materialism to our doctrine; but in the same passage he says, "In children the brain is pulpy, and in decrepid old age it is hard. It must have a certain degree of firmness and elasticity, that the soul may manifest itself with great splendour. But this consideration does not lead to materialism, it shows only the mutual union of the body and soul."

It results from what I have just said of our manner of teaching, that we are no more materialists than our predecessors, whether anatomists, physiologists, or physicians, or than a great number of philosophers and moralists, *viz.* all those who admit the dependence of the soul on the body. For, in this respect, it is essentially the same, whether the faculties of the mind depend on the whole body, or on the whole brain, or whether every special faculty depends on a particular part of the brain: the manifestations of the faculties depend always on the organization.

It is objected, that the faculties of the mind cannot depend on the organization, because man in his healthy state does not feel their dependance. Man, however, does not feel the performance of digestion, circulation, nutrition in general, and of the different secretions; but do not these functions depend on the organization? We think with Herder, that the vulgar understanding is to be pardoned, when it considers reason, or the rationality of man, as an absolute faculty which is independent

of the senses and of all organization. Yet the natural philosopher, who knows human nature by experiment, and who observes the scale of perfectibility from the lowest animal to man, is incessantly warned and informed of the influence of organization. Every thing shows him that man is not the creator of his intellectual faculties, any more than of his organic life. Thus, though we do not feel the functions of the faculties of the mind, their dependance on the organization is not the less certain.

There are also persons who maintain that, in the highest degree of what they call magnetic influence, the manifestations of the soul are independent of the organization. If this be the case, they ought to show that, in this state, the body has no influence upon the soul, and that the soul is utterly separated from the body. In this supposition, why do not these persons produce the same effects when they act upon children, fools and idiots, as when they operate upon very weak, delicate and irritable individuals? Why do the persons operated on know only what is known? Why do they not make any discovery in anatomy, physiology, medicine, or in any art or science? While there are in these subjects so many points to be elucidated, why cannot these persons do so? Hence, as long as all the phenomena produced by these artifices denote only a greater irritation and a greater energy of the faculties, and not at all a different state, we must conclude that the soul manifests itself only by the organization. We do not deny the existence of some animal fluid, called

magnetic; on the contrary we admit it. This fluid may have the greatest affinity to the nervous system; and its accumulation may increase the activity of the nerves, so that magnetised persons may have more acute feelings and judge better, than they can do in the ordinary state of irritation. But I wish to know if it be possible to communicate this fluid by the will, and what phenomena this fluid can produce? I fancy that this fluid only excites the different organs, and produces phenomena relative to every organ: magnetism consequently is only a state of particular excitement.

SECTION II.

FATALISM.

It is also objected to our doctrine that it leads to fatalism. Now it is necessary to understand exactly the meaning of this objection. Certain writers understand by fatalism, that every thing in the world, and the world itself, exist by necessity; but that all events are the result of chance, and not at all the effect of any supreme intelligence. This fatalism involves atheism; but such fatalism is quite different from the doctrine, that man has received all his faculties by creation, and that his nature is determined by it. Another kind of fatalism teaches that all physical and moral laws are created and fixed; that there is no liberty in our actions; that man does good or evil according to his faculties; that he cannot change his character; that his actions are

irresistible; and consequently that he cannot be rewarded or punished for them.

Here we must make a distinction. It is certain that the faculties of the mind are not equally distributed. There are deaf, blind, stupid, idiotic and intelligent persons from birth. In the same way, the various feelings are not equally strong in all individuals. Bishop Butler* says: "If, in considering our state of trial, we go on to observe, how mankind behave under it, we shall find there are some who have so little sense of it, that they scarce look beyond the passing day; they are so taken up with present gratifications as to have in a manner no feeling of consequences, no regard to their future ease or fortune in this life, any more than to their happiness in another. Some appear to be blinded and deceived by inordinate passion in their worldly concerns as much as in religion. Others are not deceived, but, as it were, forcibly carried away by the like passions, against their better judgment and feeble resolutions, too, of acting better: and there are men, and truly there are not a few, who shamelessly avow, not their interest, but their mere will and pleasure, to be their law of life; and who, in open defiance of every thing that is reasonable, will go on in a course of vicious extravagance, foreseeing, with no remorse and little fear, that it will be their temporal ruin; and some of them under the apprehension of the consequences of wickedness in another state. And to speak in the most moderate way, human creatures

* Analogy of Religion, p. 92.

are not only continually liable to go wrong voluntarily, but we see likewise that they often actually do so with respect to their temporal interests as well as with respect to religion." Daily experience, indeed, shows that in different persons the various feelings of the mind are active in different degrees; and hence these phenomena.

It is also certain, that the faculties of mankind and the laws to which they are subjected, as well as the laws of nature in general, are fixed by creation. All the faculties are given, and their laws are determinate in automatic and in animal life. Who for example has called himself to life? Does it depend on the will of any one to be born in this or in that country? from these or those parents? under this or that system of government, or of religion? Who has determined his sex? Who can say: I am the eldest or youngest because it has been my choice? Who can determine the accidents which affect him, the capacities of his teachers, and of all those around him from the earliest infancy? Who can prepare and produce all external circumstances according to his will? The organs of automatic life perform their functions without our will: the liver never can perform digestion; the kidneys never can secrete bile; and what is poison can never be changed into food, &c.

It is the same with animal life. The existence and the laws of the five external senses are an effect of creation. It does not depend on our will to have the power of seeing, hearing, feeling, smelling and tasting; we can never hear or see by means of the

fingers, nor smell by means of the lips &c. It is impossible to see as red that which is blue, or to see as great that which is little. The determination of these faculties may doubtless be termed fatalism. We, in the same manner, maintain, that all the propensities, sentiments and intellectual faculties, their mutual influence and their various relations to each other, are innate and determined by creation. There is, however, a great difference between the innateness of the faculties and the irresistibility of their actions. The faculties are given, and without innate faculties no action is possible; but is there, on that account, no liberty in our actions? Are the actions of the faculties in man and animals irresistible?

Neither in animals nor in man are all the faculties at the same moment active, and of irresistible force. It often happens in animals, that whilst one faculty is active the others are quiescent; and thus they perform rather one action than another. If this were not the case in animals, it would be cruel to punish them in order to prevent certain actions. If a dog who is hungry be punished for having eaten, do we not often observe that he will leave the food presented to him? And is it not the same with man? Man has a great number of faculties, but they are not always active and irresistible. We can walk, dance, sing, but we are not forced to do so. Who does not feel within himself, that he sometimes wishes for something, or inclines to perform some action, while he combats this inclination by other motives? Hence it is indubitable that the

actions neither in animals nor in man are irresistible. The muscular system and the moving powers are given and innate, but we are not forced to move our limbs incessantly; and in the same way we shall see, that the greatest number of our faculties are subordinate to the will.

It is true that the faculties of the will, and the motives which determine the will, are given and innate. This kind of fatalism must be admitted not only in man, but even in God; for perfection and all good powers are inherent in the nature of God: he cannot wish for evil. So also the superior faculties of man, called the divine part of his nature, must desire the real good of man. Hence a certain fatalism has its foundation in nature; and therefore the philosophers of China, Hindostan, Greece, the eastern and western Christians, and the followers of Mahomet, have blended a certain fatalism with their religious opinions. Indeed, it cannot be dangerous to teach such a fatalism in as far as it exists; for Christ, his apostles, and the fathers of the church have done so. A proverb of Solomon is, "The Lord gives wisdom." According to Christianity, "The tree is known by its fruit;" *—St. Paul says, "And we know that all things work together for good to them that love God, to them who are the called according to his purpose. For whom he did foreknow, he also did predestinate to be conformed to the image of his Son; that he might be the first-born among many brethren. Moreover whom he did

* Matt. xii. 33.

predestinate, them he also called: and whom he called, them he also justified: and whom he justified, them he also glorified."*—And again: "Who maketh thee to differ from another? and what hast thou that thou didst not receive?"† St. Augustine taught openly and distinctly our dependance on God, and he commanded to preach this truth. "As no one," says he, "can give to himself his life, so nobody can give to himself understanding."‡ He calls gifts of God, all good qualities, as the fear of God, charity, faith, obedience, justice, veracity.—He says, § that God has not distributed in an equal manner noble sentiments any more than temporal good, as health, strength, riches, honours, the gifts of arts and sciences. It is then positive that the faculties are innate; but we must also say with St. Augustine,‖ God in giving the power does not inflict the necessity. Thus I do not fear that the innateness of the faculties can produce irresistibility in our actions. The whole constitution of nature is determined by creation, but this necessity does not exclude deliberation, choice, preference, and acting from certain principles and to certain ends; because all this is matter of undoubted experience, acknowledged by all, and what every man may every moment be conscious of. We admit one sole Creator, who certainly has rendered consistent all physical and moral truth.

* Rom. viii. 28—30.
† 1 Cor. iv. 7.
‡ Lib. de Fide, c. 1.
§ Lib. de Correptione et Gratia.
‖ Lib. de Litera et Spiritu, c. 31.

SECTION III.

MORAL LIBERTY.

We know by daily experience that the faculties, though innate, are not compelled to act. Let us, then, examine in what liberty consists, and how it is to be defined. Here the principal idea to be remembered is the plurality of the faculties and their respective organs. Whatever may be said against them, it is indispensable for the philosopher of nature to admit them in animal life as well as in automatic life. Indeed both lives are more or less complicated in different orders of animals. Organic life, for instance, is very simple in the lower animals. In them nutrition is limited to intussusception, absorption and assimilation, while it becomes compound by degrees. Accordingly, in perfect quadrupeds nutrition is the consequence of mastication, deglutition, digestion, chylification, sanguification, respiration, circulation, assimilation, and of a great number of secondary and auxiliary functions, as of the secretion of bile, that of the pancreatic juice, the secretion and excretion of urine &c. Even the particular kinds of function which contribute to the reproduction of the organization, as intussusception, digestion, respiration, circulation &c., are composed of a greater or less number of apparatus. Yet in these, as in the simplest cases, the common

purpose is always the same, that is, the preservation of the individual.

It is the same with animal life: it is very simple in lower animals; and begins with the sense of feeling. It is multiplied by taste, smell, hearing, seeing, by various instinctive labours, by propensities, sentiments, and intellectual faculties; and finally, in man it is most complicated. Man unites all the faculties which are dispersed in different animals, and he is endowed with various faculties peculiar to himself. Thus it is an incontestable fact, and one proved by daily experience, that the faculties of man are multiplied. Let us now examine whether there be a subordination between the faculties of the mind.

It is a general law throughout all nature, that inferior faculties are subordinate to superior ones. Physical laws are submitted to chemical laws: gravity, for instance, is a physical law; and it is modified by chemical affinity. Thus the particles of any salt are attracted one to another in opposition to their physical gravity, and form a crystal. Again, physical and chemical laws, though preserved in organic beings, are modified by organic laws. Plants neither increase by juxtaposition; nor do they assimilate mere homogeneous substances. In the muscles and in the circulation of animals, the physical laws of motion and hydraulics are preserved, but they are subjected to the laws of life. Chemical laws are preserved in digestion, but they are modified by organic laws. Physical, chemical and organic laws exist in animals, but they are modi-

fied by animal laws. Animals take food, plants do the same; but animals choose it, guided by the sense of taste. Plants propagate their species automatically, but animals feel a propensity to do so. Thus in animals the propensities, sentiments and intellectual faculties, modify extremely the properties of the organization.

The same principle must be applied to the laws of human nature; that is, all inferior laws, physical, chemical, organic and animal are preserved in man, but they must be subordinate to the laws of the human faculties. Thus all faculties are not equally important; and certain faculties must be subordinate to others. Therefore, in respect to actions, I divide the faculties into three orders. Certain faculties excite man and animals to determinate actions; as hunger, physical love, the propensities to fight, build, gather provision &c. I call these *faculties of action.* Other faculties are called *auxiliary;* because they assist and modify the faculties of the first kind. Still other faculties ought to direct; and these are termed the *directing faculties.*

LIBERTY.

Being free is the opposite to being forced: liberty is the reverse of irresistibility. As we maintain that all faculties are innate, our adversaries object that all actions must therefore be unavoidable, necessary and irresistible. On the contrary, I repeat with St. Augustin,* that God, in giving the power (fa-

* Lib. de Litt. et Spir. c. 31.

culty), does not impose the necessity. Thus, it is to be inquired in what liberty consists, and what faculties produce it? Some philosophers attribute to man an unlimited or unbounded liberty: according to them man creates, so to say, his own nature; he is independent of every natural law; and his will is the only cause of his actions. *Such* liberty in a *created* being is contradictory; and hence all that can be said in favour of it is mere declamation, destitute of significance and truth.

Others maintain that the liberty of man is absolute, and that he acts without any motive. This is the same as saying, there is an effect without a cause; and such an assertion is against the laws of understanding. Moreover, liberty without motives would be in itself contradictory; for a person would thus act reasonably or unreasonably, justly or unjustly, well or ill, but always without any motive. Finally, in this supposition all institutions which respect the happiness of mankind would be useless. Education, morality, religion, punishment and reward, would be without effect, because man is not determined by any motive. According to this notion of liberty, we might expect from every one hatred and perfidy as well as friendship and fidelity, virtue as well as vice. Thus, such liberty is merely speculative. We can admit such liberty alone as corresponds with the general laws of nature, and with the nature of man. Hence, if we admit that man acts by motives, then is he subjected, like all the rest of nature, to the law of cause and effect. This kind of liberty alone has been professed by

ancient philosophers and legislators, and only this kind of liberty is supposed by morality and religion, because these furnish the most powerful and most noble motives to direct the actions of man. *Liberty consists in the possibility of doing or of not doing any thing, and in the faculty of knowing the motives and of determining one's-self according to them.* Three things then must be considered in liberty: knowledge, and will, the *motives* and the influence of the will upon the actions.

A great number of authors deny the existence of free-will, but they confound the propensities, inclinations, lusts and concupiscences, with *will.* The internal satisfaction alone, and will, are too quite different things. Neither man nor animals act freely, if they feel only an internal satisfaction; for this accompanies the fulfilling of every desire. The sheep and tiger do not act freely because they are pleased, the former with grazing, and the latter with tearing its prey in pieces. Every faculty of animal life, being active, gives a desire or an inclination; and every man and animal feels these inclinations involuntarily. They cannot change the nature of their faculties and organization: they are forced to feel hunger, if the respective nerves act in a certain manner; and they must see, if the light strike the retina of their eyes. Thus man neither has any power upon accidental external impressions, nor upon the existence of internal organs; but is obliged to feel an inclination if the respective organ be excited. Man is not master of this, and he

cannot be answerable for it. But these inclinations, propensities, or desires of different organs, are not yet *will*; for man and animals have often inclinations, yet *will* not. A dog, for example, which is hungry, but which has been beaten for having eaten such or such a thing, will not eat the meat you lay down before it:—it may be hungry, it wants; but it will not eat.—It is the same with man. How often are we obliged to act against our inclinations. Hence, by this experience we see not only that the faculties do not act irresistibly either in man or in animals, or, in other words, that there exists *liberty* or *freedom*, but also that inclinations are not yet *will*. However, freedom presupposes *will*. Therefore it is to be examined how *will* is performed.

In order to have *will*, to decide *for* or *against*, I must know what happens or has happened; I must compare: hence *will* begins with the knowing and reflecting faculties, or with the understanding; and therefore the will of every animal is proportionate to its understanding. Man has the greatest freedom, because his will has the greatest extent; and this is the case because he has the greatest understanding. He knows more than any animal; he has traditions; he compares the present with the past; he foresees the future; he discovers the relation between cause and effect. It is even to be observed that not only *will*, but also our participation and accountableness, begin with the knowing faculties. Idiots have sometimes inclinations, but they are neither free, nor answerable; and a man

of great understanding and good education is more blameable for a fault, than an uncultivated and stupid person.

The willing faculties however are not given up to chance, but submitted to certain laws; for the laws of the understanding are as determinate by creation as the laws of nutrition. Man cannot will any thing which does not seem good to him. Thus the first condition of freedom is *will*, which is the effect of knowledge and reflection. The second part of freedom concerns what is to be known and compared, that is, the motives. Will, then, is the decision of the understanding, but this decision takes place according to motives.

I shall now consider the source of the motives. They result principally from the propensities and sentiments, and sometimes from the knowing faculties. Thus the motives are as numerous as the faculties; and even their energy depends on the energy of the faculties. Hence, an animal which has many and energetic faculties, has many and vigorous motives, and its freedom is proportionate to the strength of its will, and to the number and energy of its faculties or motives. Therefore will, or the faculty of choosing or deciding, is not sufficient, but the plurality of motives is also necessary to freedom. An animal endowed with only one faculty would not be susceptible of any other feeling or motive, and its knowing and reflecting faculties could not act upon this single faculty, so as to make a comparison or choice between motives, because there was only one motive: the animal would therefore act

according to its single active propensity, and the action or inaction of this animal would be the only effect of the action or inaction of this single faculty. On the contrary, if animals be endowed with several faculties, they are susceptible of different feelings. It is true, that in this case the action of one faculty and its respective organ does not destroy either the existence or the action of any other faculty and its organ; but here it must at the same time be considered whether the animal acts without or with freedom; for the plurality of the faculties and organs alone is not sufficient. This idea is of essential importance; but was not sufficiently considered in our book on Innate Dispositions. If man or animals act by motives without will, they do not act freely. It is in that case only necessary that one faculty should be stronger than another in order to act. Give food to a hungry dog, and at the moment when he eats, make a hare run before him: the dog will eat or follow the hare according to its strongest propensity. Here is no freedom: the strongest propensity prevails. On the contrary, if another animal be endowed with the faculty of knowing and comparin; if, for instance, another dog which is fond of hunting,but which has been punished for having followed hares, feel a great propensity to follow a hare which passes before him; if he tremble and have palpitations without pursuing the hare, there is liberty: the dog chooses between different motives. He *may*, but he *will* not. Thus liberty requires will and motives. It begins with the understanding, which knows and compares the

different motives, and decides the action according to its choice. The plurality of the faculties produces only the plurality of motives; but will decides.

Even these two conditions do not yet constitute liberty: there is still a third wanting, *viz.* the influence of the will upon our actions. For, in the diseased state, it sometimes happens that we know the different motives; and that the will has yet no influence upon the actions: the faculties which constitute will may put in action certain faculties of the mind, while others are independent of it. We have seen, that while we are not answerable for our inclinations and sentiments, because they exist of themselves, and the will cannot put them in action, the will has a greater influence upon the intellectual faculties; it can reproduce their actions in thinking of different objects, their qualities and various relations to each other. The will has also an influence upon the five senses and voluntary motion. This is the reason why man is answerable for his actions, though his inclinations and sentiments are involuntary. He has power over the use of the instruments of these independent faculties; but as soon as the external senses or voluntary motion are withdrawn from the influence of the will, liberty and therefore guilt cease.

Thus, liberty requires will, motives and the influence of the will upon the external instruments. This is indeed the only true idea of liberty; but this liberty is not yet moral liberty; and it consequently remains to be examined, where the morality of our actions begins.

MORAL LIBERTY.

As the faculties are different, it is to be considered whether they are equally important. This is the case neither in organic nor in animal life. The functions which contribute to the preservation of the body are not equally important: mastication, for instance, and the mixture of the food with saliva, are less important than digestion, circulation and assimilation; and the secretion of certain glands is less necessary than respiration &c. It is the same with animal life: in respect to the external senses, every one would lose the sense of smell rather than that of sight. Who would not lose some talent, as the faculty of drawing, of music, of painting, rather than that of reflection and reasoning; and one sentiment, rather than another. Every one is offended if we call him stupid; but not so if we say that he possesses not such or such a talent. Moreover, if we examine the influence of the different faculties of animal life upon the happiness and preservation of mankind, it is easily observed that several faculties are much more important than others. Thus, the love of approbation is less important than benevolence; and the Christian religion places charity above faith and all other moral faculties. It must therefore be granted that the faculties of animal life have different degrees of importance. In this respect they may be divided into two classes, into those which are common to animals and man, and into those which are proper to man. This double

nature of man is evident, and has been designated by different expressions; the flesh and spirit, or the animal and man, or the carnal and spiritual part of man.

It is now to be inquired whether the faculties common to animals and man, or those which are proper to man, are the most important. The answer is obvious, and subject to no doubt. I have already shown that, according to a general law of nature, inferior faculties are subordinate to superior faculties. Man, by means of superior faculties, is master of other animals; and hence the faculties proper to him ought to govern and direct all inferior ones. Hence also it is evident that all motives are not equally important. In this respect, I lay down the following principle: all the motives which result from faculties common to man and animals present no morality, suppose no idea of conscience or duty, nor any idea of sin; for no animal is susceptible of these feelings. Moreover, as liberty begins with understanding, so morality begins with the faculty of duty and justice. Thus moral liberty is will, applied to absolute conscience. Absolutely good or moral actions therefore result, when will acts according to absolute conscience, or to the motives proper to mankind; and whatever is not conformable to will, applied to the motive of absolute conscience, is absolute evil. Man then has not only the greatest liberty, for he has the greatest will and the greatest number of motives, but he alone possesses moral liberty. As long as he determines himself to any action by motives common to animals,

his actions are not primitively moral, though they may be conformable to moral actions. The inferior motives, however, must be employed; they must support, and sometimes supply the place of, the superior ones.

From all that I have said in respect to moral liberty, it results that no accountableness takes place without liberty; that liberty begins with the understanding or with the faculties of knowing and choosing the motives, and of deciding according to them; that man has the greatest liberty; and that the faculties proper to man produce motives which constitute the morality of our actions.

OF MORALITY.

The natural law of the subordination of the faculties one to another leads us immediately to the consideration of moral evil and moral good, or to the consideration of the morality of our actions; and, under this head, the first thing to be considered is, whether any evil exists? I shall then examine its origin.

There exist indeed two kinds of evil; one physical, and the other moral. The first kind beyond doubt belongs to the plan of Eternal Providence; for there is a continual opposition throughout all nature. Earth, water, and air, present a perpetual scene of destruction and reproduction, of pain and pleasure. It is even obvious that in the same way as temporal good is distributed unequally and without personal merit, physical evil happens often without

any corresponding fault. This is the case both in animals and in man. What have animals done which are ill-fed and in every respect ill-treated for their services rendered to man? Who is the cause of contagious diseases? If children be begotten in the excess of debauchery, for what reason must they expiate the faults of their parents? When the hail ravages the harvest of the indolent and idle rich man, does it spare the garden of the laborious poor? This melancholy observation has been made at all times. The preacher says, "There is a just man that perisheth in his righteousness, and there is a wicked man that prolongeth his life in his wickedness."* "All things," says he, "come alike to all: there is one event to the righteous, and to the wicked; to the good and to the clean, and to the unclean; to him that sacrificeth, and to him that sacrificeth not: as is the good, so is the sinner; and he that sweareth, as he that feareth an oath. This is an evil among all things that are done under the sun, that there is one event unto all: yea, also the heart of the sons of men is full of evil, and madness is in their heart while they live, and after that they go to the dead."† In another passage, he continues: "I returned, and saw under the sun, that the race is not to the swift, nor the battle to the strong, neither yet bread to the wise, nor yet riches to men of understanding, nor yet favour to men of skill: but time and chance happeneth to them all."‡ Phy-

* Eccles. vii. 15. † Eccles. ix. 2, 3.
‡ Eccles. ix. 11, 12.

sical evil indeed does not merely exist; it comes also to all according to established laws of creation.

It is as unquestionable that moral evil exists. Although man thinks himself abased by his wickedness and imperfection, he must acknowledge the existence of moral evil. Moses said, "God saw that the wickedness of man was great in the earth, and that every imagination of the thoughts of his heart was only evil continually." * David thought, that "there is none that doeth good, no not one." † Christ taught, that out of the heart proceed evil thoughts, murders, adulteries, fornications, thefts, false witness, blasphemies." ‡ St. Paul speaks of men, "being filled with all unrighteousness, fornication, wickedness, covetousness, maliciousness; full of envy, murder, debate, deceit, malignity, whisperers, backbiters, haters of God, despiteful, proud, boasters, inventers of evil things, disobedient to parents, without understanding, covenant breakers, without natural affection, implacable, unmerciful: who knowing the judgment of God, that they which commit such things are worthy of death, not only do the same, but have pleasure in them that do them." § Thus moral evil has existed at all times, as well as physical evil; and it seems that the time when it will be rooted out is yet far off.

Let us now consider the origin and cause of moral evil. I pass over in silence the opinion according to which two creative principles—a good and a bad, are admitted. Neither do I speak of original sin in

* Gen. vi. 5.
† Ps. xiv. 3.
‡ Matt. xv. 19.
§ Rom. i. 29—32.

the first man. I do not, moreover, find any explanation of the origin of evil, by admitting free will. It is indeed true, that without liberty man never can be guilty; yet free-will does not give any idea of the origin of the evil; for as soon as free-will is spoken of, good and evil are supposed: to what purpose should there be free-will, if there were not two different things, good and evil, between which the free man may choose? It is said, that man abuses his liberty; but by what motive does he abuse it, if there be nothing from within which incites him to act badly? Liberty therefore is insufficient to explain the origin of moral evil. Bishop Butler* says: "we may observe that creatures made upright fall. —To say, that it is accounted for by the nature of liberty, is to say no more than that an event's actually happening is accounted for by a mere possibility of its happening. But it seems distinctly conceivable from the very nature of particular affections or propensions &c."

Are there any bad faculties? Gall is disposed to admit wicked propensities. He says, that man must submit to the laws of creation, in respect to moral, as well as in respect to physical evil; that no man can say he is without any temptation; and that all our thoughts and inclinations are not innocent and virtuous. He even thinks that moral evil belongs to the plan of the Creator. I am fully convinced that no faculty can in itself be bad; that all the innate faculties of man have some aim; that

* Analogy of Religion, p. 114.

every faculty is necessary; and that none leads necessarily to evil; but that every faculty may produce abuses. Particular faculties are no more bad than particular substances. I think with Philo the Jew, Eusebius, * and St. Augustin, that no substance, as fire, water, iron &c., is bad in itself, nor the cause of evil; and I think with Augustin, † that evil is not a substance, and that only the abuse of any thing is evil. Hence I consider every faculty as neither good nor bad; and that the evil consists only in particular actions. Every faculty is necessary, and none can be destroyed; for the germ contains the faculty of producing all dispositions; and therefore, parents who have lost any limb of their body, as a leg, an arm &c., get children provided with all parts of the body. But what then is the origin of moral evil?

I have spoken of the law of subordination of one faculty to another. Now all the faculties, common to man and animals, act in animals in the same way as in man; but it is never said that animals sin or commit a crime. This is a new proof that liberty does not produce moral evil, for animals modify their actions, and suppress various instincts by other motives; but no action of any animal can be considered in respect to morality.

Thus, according to these considerations, we may easily conceive how moral evil has come into the world, or what is its origin. It consists in actions which are not conformable to the whole of the facul-

* Præpar. Evang. Lib. vii. n. 22.

† Lib. de Vera Religione, c. 20.

ties proper to man. As soon then as any faculty acts without being directed by all the faculties proper to man, these declare that the actions are abuses, or are morally evil. Thus moral good is any action conformable to the faculties proper to man or to the directing faculties; and moral evil is any action which is not conformable to them. Now is it also clear why moral evil has always existed, and probably will always exist. For the inferior faculties exist, and are inherent in human nature: their use is necessary to the preservation of man; but their energy easily goes farther than the faculties proper to man permit, and then it produces abuses. Hunger and thirst will always exist: therefore at all times man may eat and drink more than the preservation of his body requires, and gluttony and drunkenness may easily take place. In the same way, all other faculties may act with greater energy than the faculties proper to man approve of; and consequently he may commit errors, faults, sins. Now also it is conceivable, why sins or actions against the moral laws of nature unavoidably produce physical evil. For the laws of nature are determinate in the physical and moral world; they are all in relation with each other; the natural order cannot be changed; and every one who endeavours to change this order, or does not act conformably to it, produces at the same time moral and physical evil. It would be easy for me to examine all the faculties and their actions according to this principle. Its consideration is of the highest importance to all those who form moral institutions. No faculty of human nature

ought to be neglected, and the sphere of activity of every one ought to be determined. Every intelligent reader who is acquainted with history must be convinced of the solidity of this principle.

Moreover, it is evident why man is inclined to moral evil.* We have seen that the organs common to man and animals are very considerable: therefore the manifestations of the respective faculties are very energetic; and for the same reason they submit themselves, sometimes with difficulty, to the superior faculties proper to man, and very seldom to the will alone. The two natures of man which combat one another † are easily understood: that is, man as animal, and man as man; or man endowed with faculties common to man and animals, and with others proper to himself. We easily conceive how certain faculties give laws to other faculties; that is, how laws began; how the law makes sin; how we know sin by the law; how until the law, sin was in the world; but how sin is not imputed when there is no law.‡ For the superior faculties command obedience to the inferior: without the existence of the superior faculties, no sentiment of law, and none of sin, could take place:

* "If we say that we have no sin, we deceive ourselves." 1 John, i. 8.

† "For the flesh lusteth against the spirit, and the spirit against the flesh: and these are contrary the one to the other; so that ye cannot do the things that ye would." Gal. v. 17.—"But I see another law in my members warring against the law of my mind, and bringing me into captivity to the law of sin which is in my members." Rom. vii. 23.

‡ Rom. vii. 7.; v. 13.

the inferior faculties may produce the same actions, as is the case in animals; but the superior faculties can alone disapprove of them.

It is also explicable how men who have not the law do by nature the things contained in the law; who, having not the law, are a law unto themselves; and who show the work of the law written in their hearts, the conscience witnessing with them, and their thoughts the mean while accusing or else excusing one another;* and also how there are elect persons. A person endowed with the faculties proper to man in the highest degree, and with very small animal faculties, will act by nature conformably to the faculties which give the law, when the animal faculties act with energy. He has no occasion for any law either putting in action the superior faculties, or preventing the abuses of his animal faculties, and is really elect. We may also understand how a person may dislike and hate evil, and yet do it;† how virtue is possible; and how merit and demerit take place. The inferior faculties ought to be subordinate, and the victory that the superior faculties gain over the inferior constitutes virtue. If the combat be difficult, the merit of vanquishing is great, while he who does good because he likes it, and has no opponent, has less claim to merit.

As the laws of nature are determinate, it may easily be conceived why the abuses of our faculties are unavoidably punished, and why punishment is a natural consequence of wickedness. Man must sub-

* Rom. ii. 14, 15.

† Rom. vii. 15—25.

mit to the conditions of nature as the Creator has fixed them. Finally, it is easily explained what is the difference between the kingdom of law and the kingdom of love, and why the law cannot be abolished, but must be fulfilled. If in all men the superior faculties were eminently active, and the inferior less and only proportionate, every one would be a law unto himself, or rather every one would do good by love; but the law or its kingdom is necessary, as long as it is necessary to excite the superior faculties, and restrain the activity of the inferior, that is, while their activity is not proportionate, and the inferior are not subordinate by love to the superior.

Here it may be asked, what individual can determine moral good and moral evil, or who can serve as a model to others? I think that it is the same with moral principles as with all other faculties. A great genius for music establishes musical principles which other persons learn; the great painter gives the rules of his art &c. In the same way, he who possesses the faculties proper to man in the highest degree, and who is capable of submitting all his animal faculties to the superior ones—he who can say, Who can accuse me of any injustice? must establish moral principles.

Those who are acquainted with the preceding considerations, or the spirit of our doctrine, cannot ask, whether it can be reconciled with moral liberty. I am convinced that no philosophy has so distinctly demonstrated moral liberty as the physiology of the brain has done. Nay it is evident, that our in-

quiries into the nature of man, instead of being dangerous to Christianity, greatly support it, and explain many expressions which have grown out of use, and have almost entirely lost their meaning. I think with Butler,* that " if in revelation there be found any passages the seeming meaning of which is contrary to natural religion, we may most certainly conclude such seeming meaning not to be the real one." It is indeed quite natural, that physical and moral truths should support one another, since there is only one Creator. Those who think that inquiries of this kind do not belong to our doctrine ought to consider that all the functions of man, which take place with consciousness, are the objects of our investigations.

Before I finish this chapter, there are to be examined several opinions relative to the questions: What is the aim of all our faculties? and which is, or ought to be, the moral motive of all our actions? The modern physiologists in France maintain that all the faculties are destined either to the preservation of the individual, or to the preservation of the species. There are, however, many faculties which do not contribute any thing to these purposes, as the song of birds, the pride of man &c. In respect to the motives of our actions, certain philosophers maintain that man acts only by interest or egotism. This may indeed be said in a very general and indeterminate sense: in other words, the greatest number of persons act according to their propensities and

* Analogy of Religion, p. 200.

sentiments; but many individuals do things which are opposite to their particular interest. Moreover, this maxim of egotism, excluding every idea of right and wrong, can never be established as a moral principle. Other philosophers and moralists wish to reduce all actions to the moral principle of charity as the only motive; but a great number of necessary actions cannot be the result of charity: thus killing animals in order to subsist upon them, singing, adoration of God &c. do not take place by charity. Others again maintain that faith alone is the true moral motive of our actions. This however is saying that there is no absolute good, and that no action was morally good before the introduction of faith. I do not deny that faith is a very important motive, and indeed one of the most efficacious ones; but I do not think that good actions become good, because they are conformable to faith. I think that they are good in themselves, and that they have been taught and commanded because they are good.

I do not think that all the actions of man can be reduced to one single motive. It seems to me that every moralist and philosopher judges rather according to his own sentiments, than to the absolute nature of the human race. Man is endowed with several superior faculties; all of them produce moral motives; and all of them are really considered in Christianity. All these faculties together ought to govern and direct our actions. If one be neglected, the moral aim of our actions is incomplete; and every superior faculty, if singly active, may produce abuses as well as the inferior faculties,

when they are not subordinate to the superior ones. The actions of man seem to be of three kinds: every individual considers either himself, or other individuals—men or animals, or his Creator. If we examine what faculties produce each kind of these actions, it will be observed that actions relative to the individual himself result from certain propensities, sentiments and intellectual faculties, but that all actions concerning other individuals, and even God, are the effect of propensities and sentiments. This explains the assertion of certain observers, that man acts only by sentiments, and not by understanding. These philosophers considered the actions of man only in respect to other persons or to society.

RECAPITULATION.

In this chapter I have considered the moral part of the faculties of the mind. With this view I have ascertained that our doctrine does not lead either to materialism or to fatalism. I have stated that, according to a general law throughout all nature, inferior laws are subordinate to superior ones; that, therefore, the faculties proper to man ought to govern the other faculties common to man and animals; that for this reason man must be free; that liberty begins with understanding, and requires will, motives, and the influence of will upon the actions; that motives are of two kinds; that the faculties proper to man procure moral motives; and that therefore man alone has moral liberty. By these considerations, I have explained the origin of

moral evil; I have shown why moral evil has always existed; why man is inclined to it; why it is unavoidably punished; why it is said that man consists of two natures, which combat one another; and why one can do what he would not do. I have elucidated how the law has begun; how persons without the law can do the things contained in the law; how virtue is possible and meritorious; and what is the difference between the kingdom of law and that of love. Finally, I have stated the aim of our actions, and observed that there is not any one simple moral motive of our actions, but that all the faculties proper to man furnish moral motives, and that they altogether constitute a perfect morality.

PART V.

PRACTICAL CONSIDERATIONS.

IN every science the theoretical and practical part must be distinguished from each other. The former considers the principles of the science, and the latter applies them. I have, at the beginning, stated that the knowledge of the human mind is interesting to natural philosophers, anatomists, physiologists, physicians, artists, teachers, moralists and legislators. Hence our investigations have an influence upon all classes of men and every profession. I have already spoken of our improvements as to anatomy, physiology, the philosophy of the mind in general, and its moral part in particular. It remains to treat of its importance in all social intercourse, in the fine arts, in education, criminal legislation and medicine. I shall therefore divide the sequel of this work into as many chapters.

CHAPTER I.

SOCIAL INTERCOURSE.

I HAVE often repeated that, in speaking of the actions of man, it is not sufficient to consider the size of the organs of the respective faculties, but that the internal organic constitution of the cerebral parts, the exercise of their faculties, and their mutual influence, contribute also to their different degrees of activity. In the physiological part I have stated that, on account of the different temperaments, we cannot compare either individuals of different species, or even different individuals of the same species, but that we only consider the various cerebral parts of the same individual. I shall now elucidate several other points to be considered by those who intend to practise our doctrine.

SECTION I.

CHARACTERS AND TALENTS ARE DIFFERENT.

A few only of the manifestations of man are the result of any single faculty: his actions are mostly the effect of the various combinations of his faculties. It is therefore very important to consider those different combinations. Propensities may be

combined with propensities, or with propensities and sentiments, or with propensities, sentiments and intellectual faculties. In the same way, every faculty may be combined with faculties of the same or of other kinds. The combinations of the propensities and sentiments with propensities and sentiments produce the different characters of men, and the combinations of the intellectual faculties, one with another, determine the different talents. It is obvious that very few characters and talents are simple, but that the greatest number of them is compound. Agreeable, polite and amiable characters result from the combinations of amiable, benevolent, and superior sentiments. Firmness, conscientiousness, and cautiousness, if predominant, render men serious in general. Characters become good and noble in proportion as the propensities and sentiments, which are common to man and animals, are subordinate to the sentiments proper to man. On the contrary, characters become impolite, disagreeable, immodest, partial, vindictive, corrupt, or untractable, if the superior sentiments be less active, while self-esteem, covetiveness, and the propensities to conceal, to fight, and to destroy, act with great energy.

The various talents in art and science result from the combinations of feelings with intellectual faculties. The faculty of constructiveness, for instance, combined with number and size, leads to the formation of mathematical and geometrical instruments; space and number are essential to astronomy; and construction, space and colour, principally consti-

tute the landscape-painter. Religious sentiments and space produce a zealous missionary. Moreover, all artists, as painters, sculptors, musicians and poets, choose their objects, and execute them according to their manner of feeling and thinking. Hence it is evident that all the functions of man are the result of the action and reaction of all his faculties together. These considerations, elucidated by different forms of the heads corresponding to the particular characters and talents, may form the object of an interesting separate book. At all events they lie out of the limits to which this work is confined.

SECTION II.

MODIFICATIONS OF THE MANIFESTATIONS OF EVERY FACULTY.

Another very important point, which has hitherto been too much neglected, concerns the modifications of the manifestations of the faculties. In philosophy it is commonly admitted, that the world is different to every species of animals, and even to every individual of the same species. This is easily understood, when we consider that all the beings of nature are in relation one to another, and that the beings endowed with consciousness are acquainted with this relation, or, in other terms, perceive various impressions of the other beings. Now it is evident that every sentient being perceives impressions in proportion to the number and energy of its

sentient faculties. Hence it results that the world is different to different species of animals; that it is essentially the same, but modified to the individuals of the same species; and that man, who unites all the faculties distributed among different animals, and possesses certain faculties peculiar to himself, has the most extended world; but that nevertheless the world of every person is modified, as well as that of every animal of the same species.

I shall now investigate with more detail the modifications of the faculties. First, then, the manifestations of every faculty itself are greatly modified in different kinds of beings. This is evident from the functions of the faculties common to man and animals, both in respect to automatic and animal life. The liver secretes bile, the kidneys secrete urine, the salivary glands, saliva, &c.; yet these secretions, and those of other organs, vary in different kinds of animals, and they are modified even in different individuals of the same species. The power of motion is modified in the muscles of different kinds of animals; and in the same way the consistence, texture and taste of these different muscles vary. The five external senses present various modifications in different species of animals, and in different individuals of the same species. It is yet to be inquired whether the faculties attached to the brain are also modified in different animals.

If we examine the functions of these faculties, there remains no doubt that this is the case in respect to the brain. The cerebellum, for instance, must be modified in different species, because the

individuals of every species prefer others of their own species. Sometimes the manifestations of this propensity, if very active, are quite inordinate, as happens also with the sense of taste and with hunger and thirst. It is the same with philoprogenitiveness. Animals love the young of their own kind more than those of other kinds. The organ of inhabitiveness must be modified in animals which live in water, upon dry land, in the air, in higher or in lower regions. Adhesiveness presents many modifications in solitary or social animals. Destructiveness and constructiveness are much modified; for animals do not kill in the same way; and the nests of different birds are not built in the same manner. The same observations may be made in respect to all propensities, sentiments and intellectual faculties. The song of different birds, and their instinct to migrate, are much modified. Thus it is certain that all the faculties of the mind are modified in different species, and in different individuals of the same species. Nay, it seems to me that there are idiosyncrasies in respect to propensities, sentiments and intellectual faculties, as well as in respect to digestion and the five senses. It is known that certain stomachs do not digest some things; that certain individuals cannot bear some odours, savours, colours and sounds. In the same way, some persons cannot bear certain modes of feeling or thinking, and certain series of tones or of ideas. The same thing is approved or disapproved according to the manner in which it is proposed.

Another reason of the modified manifestations of

the faculties is their mutual influence. I here consider only mankind. It is indubitable that if two or more persons do the same thing, it will be done with certain modifications by every one. In as far as the faculties are essentially the same, we find the same actions in all mankind: nay, in as far as the individuals of different nations have similar faculties, we observe a certain analogy in their actions and manners, because the actions are the effects of the special faculties and their combinations, and it is their modifications and different combinations that alone produce modifications in the actions. Every faculty then may be considered as combined with one, two, or more faculties. Hence it is evident that the number of binary, ternary and more multiplied combinations is immense, especially if we reflect that every faculty may be modified in itself, and may be more or less energetic. As this object is, however, of the highest importance in anthropology, and indispensable to the elucidation of our doctrine, I shall treat of it with some detail, and shall choose examples which are easily understood, and may interest every one.

Amativeness alone, or combined with adhesiveness, philoprogenitiveness, benevolence, and veneration, or with the propensities to fight and destroy &c., acts quite differently. Two mothers who both love their progeny, but of whom one has philoprogenitiveness combined with much self-love, much firmness, a great propensity to fight, and with little benevolence, while the other has philoprogenitiveness combined with adhesiveness, benevolence,

veneration, and with very little self-love and propensity to fight, will love their children in a quite different way. Determinate or individual justice is greatly modified in every person. Every where justice gives laws; but these are modified according to the simple and combined faculties of the legislators. What a difference in the characters of Lycurgus and Solon; but what a difference also in their precepts? Socrates and his disciples looked for happiness as the aim of all our actions. Socrates placed it in moral and virtuous actions; his disciple Aristippus, in agreeable impressions on the senses; Anniceris, in agreeable sensations and moral feelings; Antisthenes, in self-satisfaction; and Hegesias, a disciple of Aristippus, in voluptuousness; Theodorus, another disciple of Aristippus, considered every action which procured pleasure as good in itself and as virtuous, because, according to him, man was born in order to be happy. Diogenes, a disciple of Antisthenes, raised his mind to an absolute independence of circumstances: he became almost a savage, and had no respect for any thing.

Every where man believes in one or in several Gods: but what a difference between the Gods of different nations! It seems to me that every where the Gods are endowed with faculties conformable to those of the nations respectively, or of their religious legislators. The God of the Jews, particularly that of Joshua, and that of true Christians, are represented as very differently modified. If we ask different individuals of the same religion their

opinions about God, we even hear of great modifications. St. Peter and St. John speak of the same God of Christians, the former with fear, the latter with meekness and love. Examine the different opinions of reformers, as of Luther, of Calvin, Zwingli, and of many others. Do we not always observe in them the faculties of the individuals? Who, for instance, does not find in the principles of Melancthon the mildness and moderation of his character? A person endowed with veneration, combined with charity, attachment and understanding, and without pride, destructiveness and physical love, will establish a system of religious veneration quite different from that of a person endowed with veneration combined with covetiveness, pride, physical love and destructiveness, and without charity and understanding.

Music is different in every nation. We easily distinguish the music of the Italians, Germans, French, Scots &c. Even the music of every composer offers something particular, so that connoisseurs distinguish the music of Gluck, of Mozart, Haydn &c. It is the same with painting. All painters are colourists, but there is a difference in their choice of colours and their shades. Does not every painter prefer certain colours as well as certain objects? Hence the difference of the pictures of Titian, Rembrandt, Paul Veronese &c. Those of Paul Veronese show, moreover, that he was fond of architecture. Albano betrays in his paintings the propensity to physical love, and the faculty of space &c.

The languages of different nations present a beautiful example of the mutual influence of the faculties. I even admit it as a principle, that according to the spirit of any language we may judge of the faculties of the nation. I have spoken of a faculty which learns and knows the signs which are invented by the superior intellectual faculties and denote the feelings and ideas. Hence it is evident that a nation must have many signs if it have many feelings or ideas, and that the number of any one kind of signs indicates the energy of the respective faculty. The Greek and French languages, for instance, have a greater number of tenses than the German and English. The French language, on the contrary, is poor in respect to philosophical expressions, and to those of the sentiments: moreover, it likes not figurative expressions; while in these respects the German language is rich. The German language has also many more signs of disjunction. Frenchmen have the organ of individuality very much developed, and therefore they are fond of facts; but their faculties of comparison and causality are commonly smaller. In consequence of this, the French Institute does not admit analogies as proofs—these consist according to it only in facts; while the Germans are fond of analogies, and perhaps too much so, since they compare and wish to explain every thing. French expressions are individual without any comparison; therefore many sounds, though the same, denote different objects, and are distinguished only by accents, &c. in writing. From this we see that the distinguishing faculties are not very active

in Frenchmen. The same defect is apparent from the quite different names which they give to very similar objects, while the German and English languages are more systematic. Even the common language of Germany is conformable to the system of Linnæus. The French say, *bouvreuil, chardonneret, pinçon* &c., while the German and English preserve the generic name *Fink*, or *finch*, and join to it a distinctive character. In the same way the French say, *rasoir, couteau, canif, serpette* &c., while in German and English the generic name *Messer* or *knife* is retained, and the particular destination is affixed, as *pen-knife, cutting-knife, pruning-knife* &c. For this reason also the number of the roots of the French language is so considerable, though there is a smaller number of words than in the German which has fewer roots. Another proof that the French language is very unsystematic is, that there is very often an additional adjective, and an additional substantive, in order to designate the same idea. These examples evidently show the influence of other faculties in establishing languages. Thus the number of signs is relative to the special faculties, and the choice of words depends on the faculties which invent the arbitrary signs. The faculty of individuality being the first active in children, we may understand why nouns and verbs are first invented, and constitute almost the whole artificial language of children; and why all words may be reduced to their etymology. By degrees, as other faculties are active, other significations of signs must be pointed out, even if the signs remain the same.

The construction of every language proves also the influence of other faculties; and it denotes the manner of thinking of different nations. The French like facts, and direct their attention to them without first considering the cause. It is natural, indeed, to begin, in general, with the subject; and after that the French immediately join the action of the subject; and after this the other circumstances are expressed. If cause and effect be indicated, the French style begins with the effect, and the cause is related afterwards. The German language is quite different; and requires, in this respect, much more attention than the French. It begins also ordinarily with the subject; then follow the expressions of the relations between the subject and object, which are both mentioned; and lastly, the action of the subject upon the object is expressed. Moreover, if a fact and its cause are spoken of, the cause is ordinarily denoted first and the fact after it. It is known that certain languages admit a great number of inversions, others very few. It appears to me that the former are more logical; for it seems natural that attention should be directed first to whatever may be the most important object. The French language begins almost always with the fact: hence French understandings consider the fact as the most important. From these observations relative to languages, we may easily conceive that the spirit of any *one* language cannot become general. I am of opinion that the spirit of the French language never will please Germans: and that Frenchmen, on the other hand, will always dislike the spirit of the

German, because the manner of thinking, and the concatenation of ideas, are quite different in the two nations.

I am convinced that even different philosophical systems are the result of the different combinations of faculties. He who has more of the faculty of individuality will never neglect facts. He who possesses this faculty in a low degree, and those of comparison and causality in the highest, will begin to philosophize with cause, and construct the world instead of observing its existence. He in whom, on the contrary, the faculty of causality is less active, will reject this kind of consideration, and think that it is unphilosophical to admit a primitive cause. If, in a philosopher, the superior sentiments be very energetic, his mind is directed principally toward moral principles. This circumstance explains the various systems of virtue and morality. One makes virtue consist in prudence, another in benevolence. One considers whatever is done, as being done from a love of praise or commendation, or from vanity; and another, as the effect of self-love. Hence philosophers, as well as all other persons, think differently; and every philosopher also considers his own manner of thinking and feeling as the best. It seems to him to be right, because his consciousness tells him so; but I think he is wrong in considering himself as the measure of the absolute nature of man. I am of opinion that, in examining the nature of man, we ought to make an abstraction of our manner of feeling and thinking. We never ought to admit in man a feeling as the strongest, or

a manner of thinking as the best, solely because they are conformable to ours; nor ought we ever to deny in others what we do not possess: we ought only to observe the operations of the human mind in the conviction that all essential kinds of manifestations of the mind, that is, all particular faculties, are inherent in its nature by creation, and to observe how every faculty acts and can act, and under what circumstances it does act. In this manner I think it possible to determine the absolute nature of man, and the infinite modifications of individuals.

It would be easy to quote examples of every faculty, and infinitely to multiply them, in order to prove the mutual influence of the faculties: but I shall not dwell farther on this principle, except with regard to the abuses of the faculties. I mention this in order to show how it is possible to explain peculiarities which seem inconceivable to those who have no idea of our doctrine, and who therefore deny the possibility of determining the modifications of the functions.——Suppose, for instance, that we find two thieves confined to a prison, and we are told that one has robbed a church, the other not: in this case we may distinguish him who robbed the church from the other. If one have the organ of charity much developed, and that of veneration very little, while the other has less charity, and much veneration, we may be assured that the former is the robber of the church.——Suppose we see two women in a prison, and are told that one has stolen, and that the other has concealed the stolen things; the former will have the organ of covetiveness larger,

and that of the propensity to conceal less, while the second will have the organ of secretiveness much developed.——If a certain number of highwaymen be shown to us, and if we wish to point out their chief, we must look at the organs of self-love and determinateness.——We may distinguish a vagabond thief from a coiner of false money: the former has, besides the organ of covetiveness, the organ of space large, and the organ of cautiousness small; the latter has that of constructiveness developed.——We may also distinguish dangerous criminals from those who are more easily corrected. Any one who has the organs of the sentiments proper to man very small, and very little of will, but the organ of covetiveness, those of the propensities to fight, to destroy, to conceal, very much developed, will be corrected with much more difficulty than another criminal who has the organ of covetiveness very much developed, but at the same time the organs of the human faculties very large, and who is susceptible of moral *will*.

RECAPITULATION.

From what I have said in this section, it results that in different species of animals, and in different individuals of the same species, the actions of every faculty are modified partly by the modified faculties themselves, and partly by the mutual influence of the faculties.

SECTION III.

ON THE DIFFICULTY OF JUDGING THE ACTIONS OF OTHER PERSONS.

Having considered the modified manifestations of the faculties of the mind, natural order leads me to consider the difficulty of judging the actions of others, and determining their motives. From the preceding considerations it first results, that in every one the judgment, as well as the other functions in general, must be modified. Indeed if we attend to the judgments of different individuals in respect to the same object, if we observe their reflections, and consider what every one praises or blames, we may by experience be convinced of the truth of this assertion. It may indeed be admitted as a principle, that every one judges according to the natural modifications and the mutual influence of his faculties; and that he judges others according to his own nature, or that he takes himself as the measure of good and evil. Hence it is that God is always, and at all times, anthropomorphosed, every one modifying the Divinity, and rendering him conformable to his own manner of judging. If therefore great philosophers, moralists and others who are benevolent, consider, as to criminals and melefactors in general, the absolute conscience as their most severe judge, they suppose in them the sentiment which they themselves feel: they judge themselves in the actions of the others. In the same way whatever is conformable

to our manner of feeling and thinking is approved, while the contrary is disapproved. Hence, in order to judge well, we must first distinguish the nature of man in general, from the modifications of every individual; and then we must know our own nature and our modifications, in order not to censure others according to our favourite sentiments or ideas. Thus we must judge others and ourselves according to the same measure—according to absolute good and evil.

It is also difficult to judge the actions of other persons, and to determine their real motives, because the motives of the same action or omission may be quite different. It is proverbially said that appearances are deceitful. I shall quote only a few examples of this; but if we consider any kind of action in man, we may observe different motives to the same action in different individuals. One gives to the poor from ostentation, another from duty, a third from the hope of gaining heaven, and others again from real charity. One wishes to be acquainted with the situation of unfortunate persons before he does good; another gives as soon as he sees misery, and every one is his neighbour—his left hand will not know what his right hand does. One goes to church in order to see or to be seen, another in order to obtain the friendship of the pious, and a third from sincere veneration. One is clean only when he goes into society, while another is clean at all times, even in solitude. One cultivates an art or science from vanity, another because he is charmed with it, and a third because he finds in it the greatest advantage &c.

It is the same with the omissions of abuses. One, for instance, from charity does not steal; another steals every where except in the house of those with whom he lives; a third robs churches, but not the poor. Others do not steal for fear of being punished, or for fear of injuring their reputation, or from a sense of duty and justice &c. In short, every one knows that the same action he has done, or has not done, was not always the effect of the same motive. Thus, if an action or omission must be judged, it is necessary to consider whether it is the result of the natural energy, and of the want of the respective faculty, or whether other faculties have influenced this action or its omission. In judging others, we must consider that every faculty may be active either by its own energy or by the excitement of other faculties; and that in the same way every faculty may be inactive either by the want of its energy, or by the influence of other faculties. Hence it follows, that, on one hand, every function does not suppose a large developement of the respective organ; and, on the other hand, that the organs may be greatly developed without producing abuses. The organ of covetiveness may be very large without stealing; the organ of physical love much developed without committing any abuse &c. The functions, indeed, of very large organs may be suppressed, though with difficulty. The activity of every organ produces only a corresponding inclination, but the mutual influence of the faculties must regulate their subordination. Thus we cannot judge other persons according to our sen-

timents and faculties, nor according to one or several of their faculties; but besides their individual faculties, we must consider all their faculties together, and censure then the moral value of their actions, according to the absolute nature of man.

The consideration that every faculty may be active by its internal energy, answers the question so often mentioned in different books: what is the origin of all the sciences and arts? In examining this cause, writers commonly begin from the highest antiquity, and endeavour to show how external circumstances have produced and improved the sciences or arts. Without denying the importance of external circumstances as exciting powers, we still think that the primitive and most important cause is overlooked, and that it exists in the innate organization. It is the same as that of the instinctive labours of animals. Man invents and cultivates sciences and arts in the same way as the beaver builds its hut, and as the nightingale sings. Every sentiment and every intellectual faculty may, without external excitement, act by its internal activity, and this is the primitive source of the sciences and the arts. Scarcely could Handel speak, before he articulated musical sounds; and his father, grieved at the child's propensity to music, banished from his house all musical instruments: but this musical genius was not to be extinguished by the caprice of a mistaken parent; for the child contrived to get a little clavichord into a garret, to which applying himself after the family retired to rest, he soon found means to produce both melody and harmony.

Nature then invented sciences and arts, and revealed them to man by means of the organization. Even the gradual perfection of sciences and arts takes place, only in proportion as the individuals who cultivate them are possessed of more or less energetic organs.

Inferences.

The consideration of the two kinds of activity of the faculties leads me to the following question, What actions deserve the greatest confidence in respect to morality, those which result from good nature, or those which are the effect of virtue? Though I think that good is always good in itself, and must be approved, I yet allow that the merit of virtue is greater than that of good-nature. I agree with the definition of virtue which all great ancient and modern philosophers have given, as Aristotle, Plato, Cicero, Seneca, Kant, and others. I admit, that those who have vanquished temptations deserve particularly to be rewarded, and that by the possibility of being virtuous or vicious our actions have the greatest merit or demerit.* Nevertheless I con-

* Non virtus est, non posse peccare; cum renunciatur improbitati, statim adsciscetur virtus. *S. Ambrosius.*—Nulla sine labore virtus est. Non est gloriosa victoria nisi ubi fuerint gloriosa certamina. *Idem in Ps.* 118, *et De Off.*—Posse peccare datum est primo homini, non ut proinde peccaret, sed ut gloriosior appareat, si non peccaret, dum peccare posset. *S. Bernardus de Lib. Arb.*—Vita nostra in hac peregrinatione non potest esse sine peccato, sine tentatione, quia profectus noster per tentationem nostram fit; nec sibi quisquam innotescit, nisi tentatus; nec potest coronari, nisi vicerit; nec potest vincere, nisi certaverit; nec potest

fess that with respect to my own guidance in society, I trust more to good-nature than to virtue. I love good-nature and esteem virtue. Guided by daily experience, which shows that the greatest number of persons act much more according to their propensities and sentiments, than according to their understanding and will, I never choose for my intimate friends persons in whom the inferior organs are very large, and the superior very small. In the same way I think, that the effect of the intellectual faculties, if they act by internal energy, is much greater than if they be excited by other sentiments.

From the modifications of our faculties results still another very important practical rule—indulgence. It is impossible that other persons should in every point feel and think as we do. In the same way as it is generally admitted, that the functions of the five external senses cannot be altogether the same, and without modification—as it is proverbially said, *De gustibus non est disputandum*, so also

certare, nisi inimicum et tentationes habuerit. *S. Augustinus super Ps.* 60.—Quidam in juventute luxuriosè viventes, in senectute continentes fieri delectantur, et tunc eligunt servire castitati, quando libido eos servos habere contempsit. Nequaquam in senectute continentes vocandi sunt qui in juventute luxuriosè vixerunt; tales non haberint prœmium, quia laboris certamen non habuerunt; eos enim spectat gloria, in quibus fuerunt gloriosa certamina. *Isidor. de Summo Bono, lib. i. c.* 31.—For there are some eunuchs which were so born from their mother's womb; and there are some eunuchs which were made eunuchs of men: and there be eunuchs which have made themselves eunuchs for the kingdom of heaven's sake. *Matt.* xix. 12.—Joy shall be in heaven over one sinner that repenteth, more than over ninety and nine just persons which need no repentance. *Luke*, xv. 7.

are the internal faculties modified, and no one has a right to desire other persons to feel and think in the same manner as he does. A certain indulgence is necessary in society. I do not maintain that every manner of feeling and thinking, and every action, must be tolerated. There is a common touchstone for every individual. The feelings, thoughts and actions, must be conformable to the absolute conscience of man; but all other modifications ought to be tolerated. This principle may be applied to both sexes, to all conditions and ages; and no friendship can be permanent without indulgence as to many modifications in the manner of feeling and thinking. It is the same in religious and other opinions. St. Paul said to the Romans, "One believeth that he may eat all things, another, who is weak, eateth herbs; let not him that eateth despise him that eateth not, and let not him that eateth not judge him that eateth. One man esteemeth one day above another, another esteemeth every day alike. Let every man be fully persuaded in his own mind. We then that are strong ought to bear the infirmities of the weak, and not to please ourselves. The kingdom of God is not meat and drink, but righteousness and peace."

SECTION IV.

ON SYMPATHY AND ANTIPATHY.

Hitherto I have considered merely human nature, and individuals only in themselves; but throughout all nature beings have some relation to each other.

As we have seen that there are different relations between the different faculties of the same individual, so there exist different relations between the different faculties of different individuals. Indeed it is generally observed, that certain beings cannot exist in the society of others, while others are attached one to another. The attractive and repulsive power of physics, and the affinities of chemistry, are well known; and even among vegetables, certain species perish in the neighbourhood of certain others, while other species increase and prosper very well together. Among animals, this law exists not only in respect to different species, but also in respect to different individuals of the same kind. Certain individuals of the same species manifest a particular attachment one to another, while others cannot bear each other. Thus in a herd of cows, the bull is commonly more attached to one individual than to the rest; and birds are paired by choice &c.

It is the same with mankind. It is however to be remembered, that I do not speak of sympathy and antipathy in the same sense, as many authors do, in speaking of the sympathy and antipathy of the stomach and the five senses. They then describe what is called idiosyncrasy. It is, for instance, known that certain persons cannot digest particular kinds of food; cannot bear the smell of certain odours; are disgusted in tasting particular savours; and cannot look at certain figures, or touch certain bodies. I already mentioned that I admit idiosyncrasies in the internal faculties; but I here speak of

the natural relations between the faculties of different individuals. Certain individuals are as it were born one for each other, while others mutually feel an invincible aversion. This may be explained in the following manner. First, certain faculties of man are eminently social, as attachment and charity; and others are quite the contrary, as selfishness and pride. Moreover, according to a general rule, every faculty desires to be satisfied. Hence every person is pleased with that which is conformable to his manner of feeling and thinking: every one wishes to enjoy; and therefore every one likes those who procure or permit to him enjoyments. Hence it may be easily conceived, that there is no permanent and invariable combination of faculties: on the contrary, their relations vary in the same degree as the modifications of the faculties of different individuals. Before we can decide whether two individuals sympathize or not, we must consider all their faculties. In this respect then, it is obvious that understanding likes understanding, and every kind of intellectual faculty likes a similar faculty. The musician is pleased with music; the mathematician with mathematics; the philosopher with philosophical ideas; the philologist with languages &c. In the same way, the sentiments proper to man look for similar sentiments. A charitable person likes mild and good-natured people; and religious persons prefer similar individuals. Thus, all the faculties of the understanding, and all the sentiments proper to man, are favourable to society.

It is not quite the same with the faculties com-

mon to man and animals. Certain of these faculties are also social, as adhesiveness and, in a certain degree, amativeness and philoprogenitiveness; but the greatest number of these faculties are antisocial. Interested persons, for instance, do not like other interested individuals, except in as far as their own covetiveness is satisfied. Proud persons do not like other persons endowed with the same faculty. Proud and interested persons not only dislike one another, but they are also disliked by persons endowed with the superior sentiments. This is also the case with the propensities to fight and to destroy. Thus every one will sympathise with those in whose society his faculties are satisfied; and antipathy will be proportionate to the prevention of enjoyment.

There is a question relative to the consideration of the happiness of man, which may here be spoken of. It is asked whether in order to be happy it is better to have many or few wants? Wants in this sense are synonymous with instincts, inclinations, desires; and they are the result of the activity of the faculties. Hence this question might also be proposed in the following manner: in order to be happy, is it better to have more or fewer faculties, and to have them more or less active? I think that the number and energy of the faculties may be the cause either of a fortunate or unfortunate condition. Every faculty, being active, wishes to enjoy, and he who is possessed by many and energetic faculties, will, if his faculties be satisfied, enjoy more than another person who has very inactive faculties; but the former will also be much more unfortunate, if

his faculties be not satisfied. Happy is he, who has many faculties which he himself can satisfy; and unhappy are ordinarily those who have many and energetic faculties which can be satisfied only by the assistance of others. Unhappy also is he, whose inferior faculties are the most energetic; principally if they do harm to the health, and if their satisfaction be expensive. Yet it is to be observed that these kinds of wants are rather inordinate actions of the faculties than in conformity with their natural destination, and it is necessary to distinguish wants, as simple activities of the faculties, from their abuses. In examining this question, I here speak only of wants in the sense of activity of the faculties.

CHAPTER II.

INFLUENCE OF OUR DOCTRINE UPON ARTS AND EDUCATION.

IT is well known, that modern artists have entirely neglected the configuration of the head. I have often observed, that they give the shape of their own head to their figures, or they desire the individual they can most easily procure to sit for a model; attending in their choice to little else than age, sex &c. As, however, each talent and each peculiar character is inseparable from a peculiar form of the head, this must now become an essential study for artists, as well in order to imitate nature exactly, in the painting of portraits, as to compose ideal forms which are not in contradiction with natural configuration. Artists ought especially to be acquainted with the situations of the different organs, their external signs, and the modifications of their developement; they ought to study the form and size of every head in general, and of its parts in particular; and they ought also to know the principles according to which the activity of the different faculties and their modes are distinguished. In one word, whatever concerns the physiognomical and pathognomical part of this science is indispensable to their art.

ON EDUCATION.

In the chapter which treats of the innateness of our faculties, I have shown that education cannot produce any faculty; for before I could speak of the principles of education, it was necessary to point out the nature of man. I repeat that all the faculties of the mind are innate, and that their manifestations depend on particular organs. Hence education can take place only where the faculties, and the conditions of their manifestations, exist; for education is nothing but exercise, cultivation and direction.

Those who have the care of education will agree, that the acting powers are not equal in all individuals; and therefore the first object to be examined is the cause of this difference, and the second whether we have any influence, and in what degree, over this cause. From our doctrine it follows that the material organs produce the difference of the manifestations of the mind. As moreover, it is impossible to exercise any power upon the faculties themselves, we are obliged to confine our examination to the conditions of the material organs. In this respect, man is submitted to the general law of living nature, and like other organised beings he participates in the properties of his parents so far as their organization is propagated. Hence the first principle of all education, or of all endeavours to perfect mankind, is to observe the same method which is kept in view in perfecting all other living beings, that is, to take care that the germ be good.

Since it is by constant observation known that

the disposition to certain diseases, as to the gout, dropsy, consumption, scrofula, deafness, epilepsy, apoplexy, idiotism &c., are hereditary, several authors insist in their writings upon a better choice in marriages for the sake of the progeny. Now as it is indubitable that the manifestations of the mind depend on the organization, and as the organization is propagated, it results evidently that the first means of perfecting mankind depends on the consideration of innateness; and that, as Moses said, "the sons of God ought not to come to the daughters of man." All ancient legislators considered marriage as a very important point of their institutions. It certainly is a pity that, in this respect we take more care of the races of our sheep, pigs, dogs and horses, than of our own offspring.

After birth we have no more immediate power than before birth, upon the faculties themselves: we have some influence only upon the organization. At this period, however, it is that, strictly speaking, education begins. It is commonly divided into physical and moral; the former concerns the body, the latter the faculties of the mind. As, however, the manifestations of the mind depend on the body, this division seems to me incorrect. I therefore divide education differently, though also into two parts. I consider, under the first part, whatever contributes to the activity of the faculties; and, in the second, whatever concerns the mutual influence of the faculties, and contributes to the morality of our actions. The first condition of a greater energy of the manifestations of the mind is the develope-

ment of the respective organs; the second is the internal constitution of the organs: these two conditions then particularly constitute the object of physical education. The third condition is the exercise, and the fourth the mutual influence of the faculties.

Though we have great power over physical education, yet innateness is, in this respect, of the highest importance; for there are individuals who resist all hurtful influence and prosper, while others are overcome by slight impediments. After innateness, the influence of climate, air, light and food—in one word, of all the hygiena, is the most important. Hygiena then must be studied according to temperaments, ages, professions and climate; and all its rules must be established according to a long series of observation. The law of nutrition is general throughout all organised beings, why should it not be applicable to man? And as the whole body is modified by nutrition, we must admit that it is also the case with the nervous system, which is nourished in the same way as all the other systems.

In respect to exercise, as the third condition which contributes to a greater energy of the manifestations, I mention that its influence is observed throughout all living beings, as well as in the automatic and animal life of man. No exercise however can take place if the organ be not given; and exercise will produce a different effect according to the developement, and the internal constitution of the organs. Here it may be asked whether the

organs increase by exercise? This may certainly happen in the brain as well as in the muscles; nay, it seems more than probable, because the blood is carried in greater abundance to the parts which are excited, and nutrition is performed by the blood. In order however, to be able to answer this question positively, we ought to observe the same persons when exercised and when not exercised; or at least observe many persons who are, and many others who are not, exercised during all periods of life. Strictly speaking I consider in exercise only the facility of action produced by it. The fingers of an individual, habituated to play upon the pianoforte, do not always increase, but their motions become more facile and less easily fatigued, than in a person who seldom makes use of his hands. The part of education which concerns exercise is still extremely defective. I shall mention only its chief principles. First, to exercise is synonymous with putting in action: hence in exercising one faculty, we do not exercise another, and every faculty must be exercised in itself. Now what shall we say of that education which endeavours to cultivate feelings by exercising intellectual faculties or mere verbal memory? Is it conceivable that the feelings are not to be learned? The feelings must be educated and exercised in the same way as the intellectual faculties, that is, by putting them in action. Speak to a child of music, but prevent him from hearing it, and never permit him to play on any musical instrument—can you imagine that his faculties of tune will be exercised? Speak to a child of compassion,

but let him never see any unfortunate being—will his benevolence be exercised? This consideration explains the ancient adage, *Verba movent, exempla trahunt*.

Moreover, no faculty can be exercised before its organ is developed. Certain organs, however, are early developed, and others increase later; some act early and last during life, and others begin to act early or late, and do not last till the end of life. This is necessary to be observed in a correct plan of education. The fourth means of activity consists in the mutual influence of the faculties. As I have considered this in another chapter, it is not here necessary to enter into any detail. I shall therefore state several notions, with regard to the second part of education, which concerns the direction of the manifestations.

In order to understand this consideration, it is necessary to recollect what I have said of the sphere of activity of every faculty, of their mutual influence, of their natural arrangement with respect to morality, and of the modifications of every individual. All these notions are necessary to education if it intend to direct action. The basis then of all education is, that the faculties common to man and animals ought to be directed by those which are proper to man. Moreover, it is to be considered that every one is fond of what gives him pleasure; for this principle, combined with that of morality, will greatly support the direction of the faculties. If, for instance, love of approbation exist in a child, it cannot be annihilated but must

be directed, and ought to be approved of in as far as it is combined with superior sentiments: praise is to be given to him for his benevolence, justice, perseverance, and other noble manifestations.

A third principle is, that no action takes place without motive. The motives are of two kinds; superior or inferior. The former are the best; but if the manifestations of the superior faculties be very weak, we must supply their place by the inferior. Man is susceptible of shame, fear, interest, of the enjoyments of the five senses, of hunger and thirst, of bodily pain and pleasure; he likes his personal freedom &c.; hence all these sensations become motives for him to act in various ways. It is also to be considered that, besides these two kinds of motives, the will contributes much to the direction of the actions, because the faculties of will render man attentive to the motives. Hence he who has more will, or whose reflecting faculties are more active, who compares better the present with the past, and foresees the future, who distinguishes easily the relation between cause and effect &c., will consider more exactly different motives, and will form a different decision from him who pays very little attention to them.

Another essential point to be considered in education is, that not every one is fit for every condition. It is a general complaint that very few persons occupy the places to which they are destined by nature. This great error in society will exist as long as the unity of faculties is believed, or as long as the general faculties of the mind are considered as

special. It will be corrected when the true special faculties are known, and when it is admitted that the manifestations of every special faculty depend on a particular organ. Before I finish this chapter, I may mention another great error of education. Many things are learned in order to be unlearned, and auxiliary faculties often are not at all exercised. To obviate this it is necessary to know not only that every faculty in itself must be exercised, but also that certain faculties are required for different professions, arts or sciences. All the faculties proper to man ought to be exercised in every one; but among the others a choice ought to be made, and those only which are indispensable or auxiliary ought to be exercised. I conclude this subject with the remark, that those who endeavour to educate men ought to begin by studying the nature of man.

CHAPTER III.

INFLUENCE OF OUR DOCTRINE ON CRIMINAL LEGISLATION.

I SHALL on this subject mention only a few general ideas. First, I repeat the remark, that the nature of the human race is by no means known. It is therefore in no way astonishing that the means which have been and are still employed for correcting malefactors have not succeeded, and neither do nor can succeed. I consider the principles according to which institutions for correction and punishment ought to be established, as the continuation of education, that is, of the education of bad children. Neither all adult persons nor all children can be left to themselves, and to the motives which they find in their minds; for these very often would not be sufficient to produce moral actions, and hence governments are obliged to direct the actions of society. Now it seems to me that the aim of all institutions ought to be essentially the same, that is, to render subordinate the actions of the faculties common to man and animals to those which are proper to man; or, in other terms, to combine the common happiness, as far as possible, with that of every individual.

I have shown that the superior faculties produce

laws, and that without them no law could exist. It is now to be observed that every perfect institution ought to be founded upon all the superior faculties together. It is defective as soon as one faculty is neglected. In this way only it can be, according to the absolute conscience, wise, charitable, just, and immutable. Though the branches of legislation are very numerous, they ought all to have the same aim; and moral and religious precepts, and civil laws, ought to agree with each other. I also think that all institutions, called houses of correction and prisons, ought to have the same aim, and be established upon the same principles. Punishment ought to be only a means of correction, and not the aim of any legislation. The faults, errors and crimes of adults must be prevented in the same way as those of children; I mean, by education in all its extent. Adult persons, who commit errors, ought to be corrected; and, if any one be incorrigible, society must be secured against him. It is not my intention to enter into details; I wish only to call the attention of moralists and legislators to the knowledge of human nature, and to show that our doctrine is intimately connected with all professions in society, and with all the actions of man.

CHAPTER IV.

INFLUENCE OF OUR DOCTRINE UPON MEDICINE; OR ON THE DISEASED STATE OF THE BRAIN, AND ON THE DERANGEMENTS OF THE MANIFESTATIONS OF THE MIND.

CONSIDERATIONS of this kind belong especially to medical men. I shall therefore develope only certain ideas which may have some interest with every intelligent reader. The first distinction to be made concerns the difference between the diseases of the brain with respect to its automatic life, and the derangements of the manifestations of the mind. The diseases of the brain and the derangements of the mind may perhaps be considered separately by philosophers; but they are too often so considered by physicians, though these latter never ought to do so. It would evidently be very odd if we should examine the diseases of the lungs, liver, stomach &c., without considering the derangements of their functions, or if we should speak of the derangements of respiration, secretion, digestion &c., without thinking of the diseased state of the relative organs. Physicians, however, who speak of the derangements of the manifestations of the mind without considering the cerebral organization, proceed in a similar manner. Such an error is immaterial as

long as it is not applied to practice; but it is hurtful and unpardonable when it is necessary to act and to cure; or when institutions for such unfortunate creatures are established according to such conceptions.

The importance of these considerations will excuse my digressing from the object of the work. Indeed I should be very happy could I call to them the attention of those who contribute to the foundation and direction of similar institutions, which, according to their common arrangements, I should be inclined to consider as indeed mad-houses, not houses for madmen. They are at least an evident proof of our ignorance as to these diseases—an ignorance which does greater harm to humanity than any kind of insanity. I cannot help confessing my indignation at such institutions, and my pity for those unfortunate creatures who are given up to chance only from our ignorance. What would a scientific physician think of hospitals wherein all patients were received indiscriminately, curable and incurable, cripples, blind, deaf and dumb, with acute, chronic, infectious and other affections, without any medical arrangement as to the cure of them —where the patients were only separated according to the payments made by their friends—where the rooms or wards were indeed kept clean, and every hurtful accident prevented, but where all care was confined to a good physical and, as it is called, moral treatment—where the permanent direction of the institution was entrusted to a man who had no idea of any disease, and who considered this object

only as a pecuniary affair—and where the plan of distribution of such institutions was committed to architects? Is it not then shocking to be obliged to say, that all these faults may be observed in many institutions for the insane? A great deal is spoken of moral treatment; and it is justly considered as more important than the medical; but I cannot call it rational, because it is not adapted to the nature of man. Even the most obvious idea, the indispensable necessity of separating the patients, is neglected. The most furious and the most gloomy and melancholy, the most imperious and the most fearful and anxious, the idiot and the most vociferous, the most religious and most villanous, are put together. If this be moral treatment, then that expression seems to me synonymous with ignorant and stupid. I shall not detail other defects which may be observed in such institutions. These cannot be perfectly regulated before the nature of the mind and of its manifestations is pointed out. In general it was till the present time impossible to conceive the nature of the derangements of the manifestations of the mind, because the conditions necessary in the healthy state were not known. Mr. Haslam * says, "The difficulty of proposing a satisfactory theory of the human mind must have been felt by every person who has touched this delicate string since the days of Aristotle. Every contribution to illustrate what are the powers of mind we possess; how we are acted upon by external circum-

* Observations on Madness, 2d Edit. p. 7.

stances in the acquisition of knowledge; and concerning the manner in which we use this knowledge for the purposes of life, ought to be candidly received. It is, therefore, not astonishing that the knowledge of the derangement of the mind is so little understood." In another passage* he says, "Whenever the functions of the brain shall be fully understood, and the use of its different parts ascertained, we may then be enabled to judge how far disease, attacking any of these parts, may increase, diminish, or otherwise alter its functions."

Indeed, this branch of medical science is extremely backward. "The pathology of the brain and nervous system," says Dr. Powell,† "appears even at present to be more defective than other branches of medical science, and most practitioners must have felt cause to lament their previous uncertainty with respect to the altered condition of these parts, when the real nature of the diseases has been ascertained by anatomical investigation. If we farther compare the actual symptoms of various affections of the brain with those by which they are characterized in systems of nosology, we may, perhaps, be led to wish that the whole subject should be new modelled." Dr. Powell also shows himself to possess knowledge at once scientific and practical, in urging the examination of organic alterations as an indispensable means of instruction; in

* Loc. cit. p. 237.

† Some Cases, illustrative of the Pathology of the Brain; read at the College 22d Dec. 1814. Med. Trans. vol. v. p. 193.

recommending to practitioners more precision in their descriptions; in attempting to promote our knowledge of this class of diseases by accumulating facts, and by comparing the symptoms with the changes which take place. As it is certain that all the manifestations of the mind take place by means of the organization, and as the organization (not the mind itself which is immaterial) may be deranged, the derangements of the manifestations of the mind are easily understood. It is obvious that the physiology and pathology of the brain are submitted to the same principles as those of the other parts of the body, and all that may be taught of these is also applicable to the brain. I shall elucidate this assertion by certain examples.

The manifestations of all the faculties of the mind, or of any one of them, may be deranged in the same way as the whole of automatic life, or as certain functions in particular. The diseased state of the brain is sometimes perceptible and sometimes imperceptible on dissection. It is perceptible in the brain in the same cases as in other parts. A defective developement of the whole or of its parts, a too rapid developement, inflammation and its consequences, as serous secretion, dropsy, suppuration &c., are perceptible in the brain as well as in other parts. Many other diseased affections of the brain, as gout, hydrophobia, violent concussion followed by death &c., leave no perceptible traces in the brain any more than blindness by worms is perceptible in the optic nerve, or convulsions in the muscles, or an idiosyncrasy of digestion in the stomach. Hence it

is impossible to deny the diseased state of the brain, because it cannot always be seen or touched.

Among the perceptible diseases of the brain, I have mentioned its defective or too rapid developement. This latter ought to be adverted to by all parents whose children increase rapidly, especially if this be the case with their head. On account of such rapid increase the organs are not sufficiently strengthened, and such children are exposed to various accidents, particularly to inflammation, and acute dropsy of the brain. I am convinced of this truth by numerous dissections. During the period of dentition they require particular attention. At this age the inflammation of the brain is very dangerous, and easily overlooked, because it is not accompanied with violent delirium, fury and similar signs. Physicians are generally wrong in thinking that violent delirium and fury are the only signs of inflammation of the brain. In these cases, the bodily strength of children seems indeed to be weakened and even exhausted, and the apparent weakness is often accompanied with numbness, convulsions, coldness, and paleness. It is evident that those who then administer stimulating things do great harm. Upon the whole I am by repeated observations convinced of the accuracy of what Dr. Powell also states, that "inflammation of the brain is by no means unfrequent, while we rarely find it accompanied by the symptoms which" (according to the theoretical opinions of the schools) "should designate phrenitis. The symptoms are referable rather to oppression of nervous power than to increased ac-

tivity of the blood-vessels." Did I not think that it would be tedious to the reader, I should describe this diseased state in all its details; but as it is merely medical, I shall not venture beyond the limits of this work. I need only mention, that the minds of delicate children who have a large head, or even of those whose head increases rapidly, though they are in good health, ought not to be occupied too early and too seriously; and whatever carries the blood toward the head ought to be avoided. The faculties of the mind in those children act commonly with too great energy. Certain physicians are wrong in maintaining that round heads are more subject to this disease than those of other forms; for very different and very beautiful configurations of the head are no security against it. It takes place most frequently from two to nine years. In general it happens with the brain as with all other parts: the frequency of disease coincides with developement, and the greatest energy of faculty.

Moreover, the brain suffers idiopathically, that is, is diseased by itself; or sympathically, that is, is deranged by the influence of other parts. The abdominal viscera and the brain are in intimate connexion. If the functions of the viscera be disturbed, the actions of the mind are not perfect; and, on the other hand, the affections of the mind disturb the functions of the viscera. If, for instance, we feel grief, the digestion is less perfect. The law of sympathy then between the brain and viscera is the same as between other parts. In the same way as one gets a cold, another a tooth-ache, a third an

ophthalmia, a fourth a diarrhœa, and all from the influence of cold and wet feet, so in different persons who feel grief, the functions of different viscera are disturbed, and *vice versâ*.

Finally, the curative method must here be modified according to the individual, in the same way as the treatment of every other disease. Hence it is obvious that the brain is subjected to the same laws of nutrition, increase and disease, as every other part of the body; and if other parts may be cured, the brain must be curable too. It is also obvious that the propensities, sentiments and intellectual ideas, are to the brain what food is to the stomach, and air to the lungs; and that therefore the moral treatment of insanities belongs also to their curative method. Those therefore are certainly wrong who permit to madmen a kind of mental occupation, about which their mind is deranged. It is on the other hand a great mistake to think that moral treatment alone is sufficient.

It may now be conceived why we cannot accede to the common division of mental diseases. This is founded upon a division of the pretended faculties of the mind. But I have shown that, till the present time, the particular faculties of the mind were not known; and hence it was impossible to make a true division of their derangements. If my division of the faculties be true, the derangements of the mind will be divided in the same manner. There will be derangements of propensities, of sentiments, and of intellectual faculties. All derangements will be considered as the immediate or mediate result of

the disturbance of the organs. Every reasonable mode of treatment then must be determined according to the cause and nature of the disease, and modified according to the individual constitution, age and peculiar circumstances of the patient; and if this be not the case, or if it be impossible, the whole curative proceeding will be vague and merely experimental.

The following consideration relative to the derangements of the mind may show how little the spirit of our doctrine is known, even by those who oppose it. Pinel supposed, that we pretend to know in general the disposition to mental alienation by the external form of the head. To illustrate this matter, he caused two skulls to be drawn which have nearly the same form. One of these skulls belonged to a madman, the other to a person of sound faculties. Pinel intends, by this, to prove that it is impossible to distinguish madness by the configuration of the head. Yet he had measured the skulls in all their dimensions, compared both halves one with another, and all their dimensions according to the proportions of the Apollo de Belvidere, in order to point out the reason of madness. At the end, moreover, he says, "I must be on my guard against hasty conclusions. I confine myself to historical details, without pronouncing that there is a connexion between idiotism and faults of conformation."

I have explained that the size and form of the whole head do not at all indicate the particular

faculties of the mind; and on this account also the form of the skull cannot indicate the derangement of the faculties. We except however idiotism from birth; for we are not of the opinion of Pinel, who perhaps did not see a sufficient number of such heads. If we find any observation confirmed and proved at all times and every where, we consider it as established, being convinced that the laws of nature are constant. If we do not admit this conclusion, there will be no physical truth. We certainly think that in a too small and defective brain, the mind cannot manifest itself. But, I ask Pinel, whether a tongue which gives an appetite for coal, chalk, dirt &c., has a peculiar form? whether eyes which see during night differ in shape from eyes which see only in day-light? Every one before he falls into any disease has the same shape of bodily parts as he has afterwards. In the same way, brains of all forms may fall into disease; and therefore the heads of madmen must be very different as well as those of persons endowed with sound faculties. It is however, a positive fact, that certain configurations of the head are observed in certain derangements of the mental faculties. In idiots from birth, the head is too small, or too large, that is, extended by water. Epileptic persons have commonly small heads, and the vertex very high in comparison to the rest of the head. Moreover, if any organ be extremely developed, and the person become weak and irritable, it is natural that this developed organ should manifest a greater activity than the other

organs. However, it cannot be maintained that other organs, which are less developed, cannot become extremely irritable and produce fixed feelings or ideas.

I shall farther speak only of one circumstance, which is of the highest importance, and deserves the attention of all observers, but which is too much neglected. Many diseased affections appear particularly at certain periods; and the cause of any disease though permanent, produces greater derangement at certain times than at others. These periods of irritability have also the greatest influence upon madmen. Certain authors consider the moon as the cause of this periodical excitement; but it coincides with all the phases of the moon, and its real reason seems to be unknown. It is indubitable that these periods of irritability exist. They affect all persons, men and women, at least once within twenty-eight days. Weak and irritable persons feel their influence twice within the same time. Almost every one is from time to time, during a few days, more irritable; his mind is not disposed to any application, and is easily fatigued; his thoughts are not consecutive; he wishes to remove all impressions of the senses, and is sometimes offended by things which at other times seem indifferent; he is morose without reason, and more disposed to quarrel or to dispute; his appetite is less, and all his excretions more copious, &c.

At this period of irritability a greater number of quarrels, disputes, duels and of certain crimes, as murders from revenge, take place. Such periods,

therefore, never are the moments most favourable for conciliating two disunited persons. Moreover, at these periods there is in all chronical diseases an exacerbation of symptoms. Hemopteses, abortions and natural births are more frequent; and those who suffer by piles are more tormented. It is an ancient observation, that in certain weeks there are few births, in others they are numerous. This is now explained, since the delivery coincides with the period of the tenth menstruation, and the menses coincide with these periods of irritability. This explains also, why at certain periods, many women have their menses, and at other times very few. At these periods, women deserve also more indulgence on account of their irritability.

These periods are shorter or longer, weaker or stronger, according to the season, weather, temperature, and the individual irritability of men and women. A great number however of individuals of both sexes, and always the same individuals, are subjected to the same periods; and every one according to his own sensations may determine, whether the effect of the periods are weaker or stronger, shorter or longer, in other persons who belong to his class. The cause seems to be quite general. Its influence however is not the same upon all individuals, because strong persons feel a similar influence only once, and weak persons twice during the same time.

These periods of irritability explain why certain persons are subjected to different sorts of periodical fits; why others see spectres only once or twice in

a lunar month; and why there are more suicides at one time than at another; why sometimes their melancholy seems to be cured, but returns; why such individuals being saved or prevented from destroying themselves, after a few days are glad of being alive; why, yet a short time after, they make new attempts to finish their existence; and why they repeat them three, four, five, and more times, till at last they succeed. Suicide may be the result of despair, of offended pride, of shame &c., but it undoubtedly is very often produced by disease; for the propensity to suicide is endemical in certain countries. At Geneva, and also about Jena, Halle, Hamburg, &c. it is very frequent; while at Vienna it is very rare. Sometimes suicide is epidemical; and is more frequent at certain times than at others: hence its cause lies in the bodily constitution, and it is excited by external influences. Finally, like many other alienations of the mind, suicide is even hereditary. Different symptoms which are observed in such unfortunate creatures prove evidently a diseased state. At first there is great disorder in the functions of the viscera of the abdomen, as eructations, flatulencies, an inordinate appetite, irregular evacuations; and in women, derangement of the menses. The complexion becomes sallow or yellowish, and of an earthy colour, principally about the nose and mouth; the face loses all its vital lustre; the eyes are dim and weak; and the white of the eyes is of leaden hue. In other individuals, the face is high-coloured, lively and much animated,

and the eyes are inflamed. Certain patients of this kind grow lean, but others preserve their plumpness and strength. Sometimes the whole surface of the skin is insensible, and the patients complain that their hands and feet are stiff and benumbed. More frequently, however, the sensibility of the skin is increased, and they feel either in the whole body, or only in certain parts, principally in the thighs and feet, a burning heat. Sometimes this heat disappears suddenly at one place, and appears again at another: it is often felt in the intestines. The greatest number of these patients are weak and pusillanimous, so that very strong men tremble before children. Certain patients torment those around them in various ways, and about inconsiderable things; they are displeased with every thing; they see nothing but wickedness and misfortune; even when their situation might be the happiest, and all external circumstances indicate prosperity, they despair, and fancy that they and their family may die of hunger and misery. Certain individuals imagine that they are despised or persecuted by every body. The greatest number of these patients feel a permanent pain above the root of the nose, and in the midst of the inferior part of the forehead, and sometimes at the top of the head. Others complain of an insupportable tension in the forehead, and of a painful constriction in the region of the diaphragm. Sometimes they suffer convulsions, suffocating anxieties, and an involuntary inclination, or secret impulse, to kill themselves. Certain persons cannot

take the resolution of communicating their feelings to other persons. Sometimes all these symptoms disappear suddenly; but a short time after they return. Certain patients have particular ideas, inspirations and visions. At first they judge of their state exactly; they consider these feelings and ideas as illusions, and they combat them with moral and religious principles; but when the disease increases, they are persuaded of their reality, and they sometimes fancy that they see angels, or hear voices which excite them to put an end to their life.

Certain individuals are still more unfortunate. They wish not only to kill themselves, but begin to destroy other beloved persons, as a child, a wife, or a husband. They struggle sometimes for several years against such dreadful ideas; and they sometimes carry about them destructive weapons for several years, unresolved concerning the manner, place, and time, when they shall kill themselves and their relations. Certain persons keep a note book which shows evidently the derangement of their mind; they sometimes write down,—I am mad, I am distracted, and (thinking of self-destruction) I shall yet do it.

Such patients are commonly considered as turbulent, exalted, whimsical and fractious men. They are ill-treated, reproached or derided; they are even accused as impious, instead of being treated with mildness, felt for, and trusted to the attendance of a philosophical physician. Those who consider this disease as incurable are mistaken, though it is

true that, given up to itself, it most commonly terminates in involuntary destruction. When the catastrophe happens, different external and accidental circumstances are considered as its cause. If a husband kill his wife, or a wife her husband, or parents their children, a great number of persons consider these actions as the most horrible crimes, because they destroy the life of other individuals on being tired of their own; but the judgment of a philosophical physician is quite different. He perceives in these deplorable actions only the signs of a terrible disease, most deserving of pity. The opposition of the actions of such unfortunate persons to nature ought to have excited the attention and reflection of every one who studies mankind. It is impossible to conceive that a wife who loves her husband, and *vice versâ*, and parents that love their children, will assassinate them so long as their mind is not at all deranged. Add to this, that murderers of this kind have neither terrestrial advantage nor revenge in view; and that after those actions they sometimes kill themselves, or accuse themselves before a magistrate and ask for death. How is it possible not to observe in this a derangement of the mind, especially if a true view of the preceding symptoms be taken?

The skulls of such unfortunate creatures also prove the disease of their brain, for the bone is in general dense like ivory. From this diseased state it may easily be conceived, why certain observers have found the corpus callosum altered in suicides; because, if

the whole brain be in a diseased state, the corpus callosum, as the commissure of both hemispheres, must be altered too. Thus it is certain, that suicide is very often the result of disease, and is influenced by the periods of irritability.

Many other considerations relative to the derangements of the manifestations of the mind belong only to medical men, and I pass them over in silence.

RECAPITULATION AND CONCLUSION.

From all that I have stated in respect to the knowledge of man, it results that the method of studying his nature must in future be different from what it hitherto has been—that we have shown the real structure of the nervous system of animal life, established a physiology of that organ and of the external senses, and reduced the physiognomical knowledge of the mind and its natural language or pathognomy to positive principles; that the philosophy of the mind must be entirely changed;—that our doctrine does not lead to materialism and fatalism, but elucidates the reality and determinate meaning of moral liberty;—that thereby our judgment is guided in every social intercourse;—that its application is indispensable to artists;—that education and the reform of criminals ought to be founded on the knowledge of man; and finally, that no pathology of the manifestations of the mind can be established, before the conditions of their healthy state are determined. Thus, with respect to the subject of our inquiries, I believe I have justified the assertion,

that it seems impossible to point out an object more interesting to natural philosophers, anatomists, physiologists, physicians, artists, teachers, moralists and legislators.

Explanation of the Numbers referring to the various Organs marked in the Frontispiece and other Plates.

I. Organ of amativeness.
II. ——— philoprogenitiveness, (*love of offspring.*)
III. ——— inhabitiveness?
IV. ——— adhesiveness.
V. ——— combativeness
VI. ——— destructiveness.
VII. ——— constructiveness.
VIII. ——— covetiveness.
IX. ——— secretiveness.
X. ——— self-esteem.
XI. ——— love of approbation.
XII. ——— cautiousness.
XIII. ——— benevolence.
XIV. ——— veneration.
XV. ——— hope.
XVI. ——— ideality.
XVII. ——— conscientiousness.
XVIII. ——— firmness.
XIX. ——— individuality.
XX. ——— form.
XXI. ——— size?
XXII. ——— weight and momenta?
XXIII. ——— colouring.
XXIV. ——— locality.
XXV. ——— order?
XXVI. ——— time?
XXVII. ——— number.

Explanation of the Numbers and Signs marked in the Anatomical Plates.

1. Decussation of the pyramidal bundles.
2, 3. Accessory nerve.
4. Hypoglossal nerve.
6. Vocal nerve.
7. Glossopharyngeal nerve.
9. Auditory nerve.
10. Abductor nerve.
11. Facial nerve.
12. Fifth pair of nerves.
16. Corpus mammillare.
20. Optic nerve.
18, 19, 21. Roots of the olfactory nerve.
23. Bulb of the olfactory nerve.
34, 35, 37, 38. Transverse bands.
47, 48. Place of the organ of amativeness.
48, 49. ——————— philoprogenitiveness.
49, 50. ——————— inhabitiveness.
50, 51. ——————— self-esteem.
51, 52. ——————— firmness.
52, 53. ——————— veneration.
53, 54. ——————— benevolence.
54, 55. ——————— comparison.
55, 56. ——————— individuality.

57, 58, 59. Septum lucidum.
61. Commissura anterior.
62. Centre of the fundamental part of the cerebellum.
63. Fibres which are connected with the septum lucidum.
70. Nervous bundles of the organs of the feelings.
86, 87, 88, 90. Layer of fibres in the middle line of the nervous apparatus.
E. Pineal gland.
M. M. Third ventricle.
S. Ganglion or corpus dentatum of the cerebellum.
a. Corpus olivare.
b. Great commissure of the cerebellum (pons Varolii).
c. Entrance of the anterior pyramids into the pons.
e—e. Corpus restiforme.
f. Interior of the pons.
g. Crura cerebri.
m. m. Fourth ventricle.
$\lambda\ \mu\ \lambda$. Corpus callosum.
φ. Canal of communication between the third and fourth ventricle or aqueduct of Sylvius.

THE END.

C. Baldwin, Printer,
New Bridge-street, London.

Fig. 1.

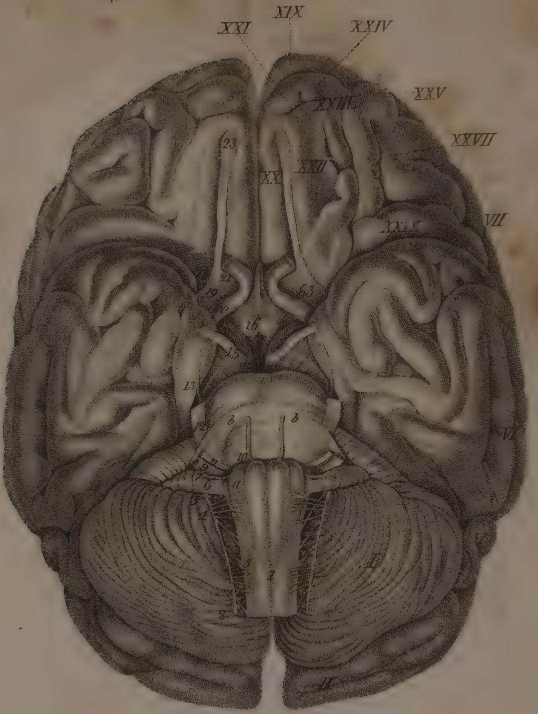


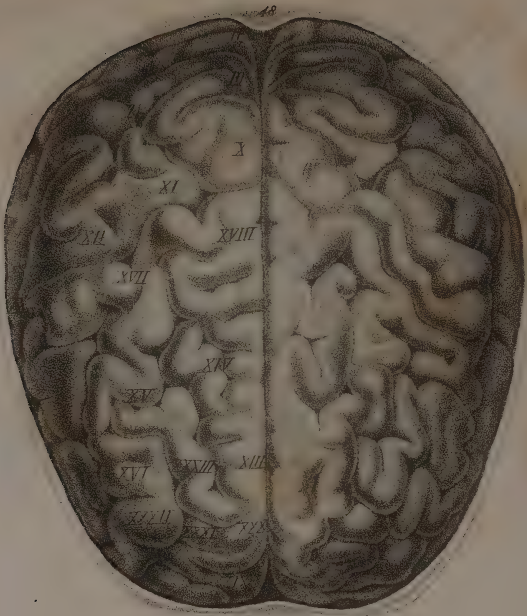
Fig. 2.

Engraved by J. Mitchell

Drawn by Prêtre

London Published by Robert Baldwin Pater Noster Row Nov.r 1814

Fig. 1.



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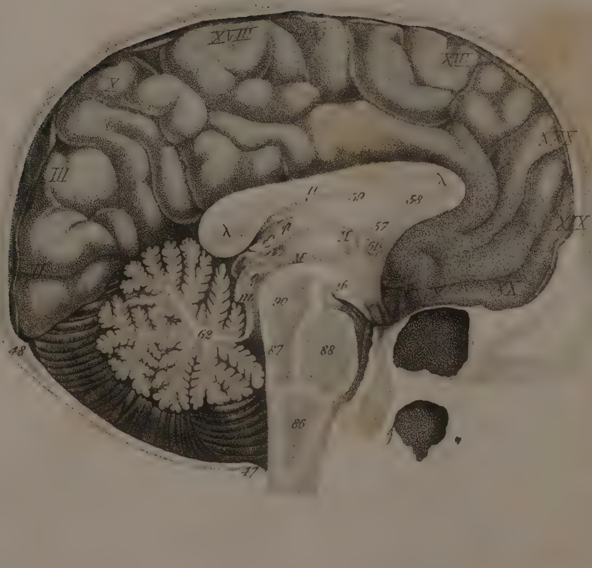


Drawn by Prêtre

Engraved by J. Mitchell

London Published by Robert Baldwin Pater Noster Row Dec.r 15. 1814.

Plate III.

Fig. 1.

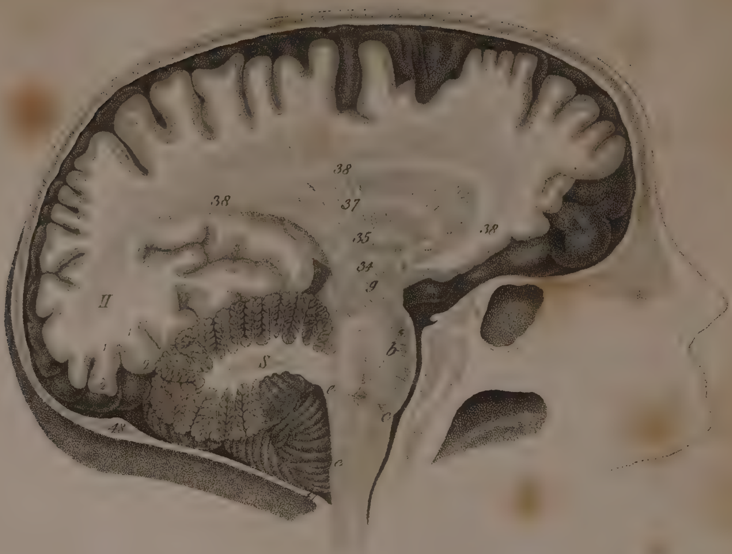
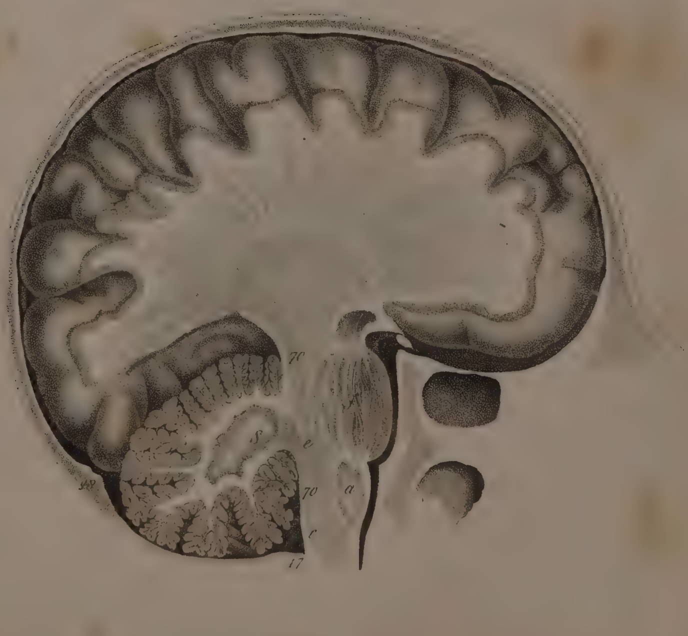


Fig. 2.



Drawn by Pelètre *Engraved by J. Mitchell*

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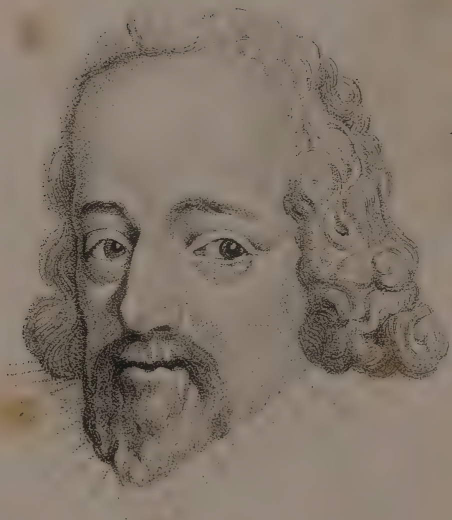
Fig. 1.

Fig. 2.



Drawn & Engraved by F. C. Lewis.

London, Published by Robert Baldwin, Pater Noster Row, Dec. 15, 1814.

Fig. 1.

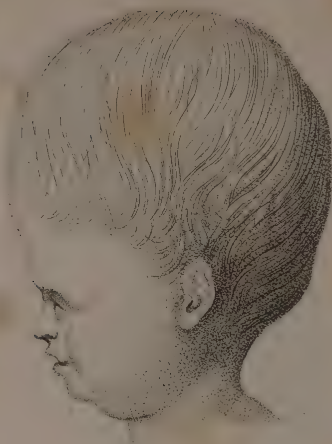


Fig. 2.

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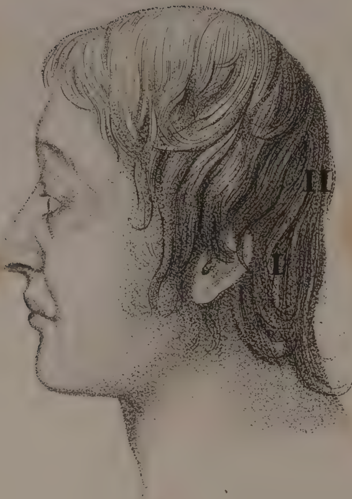
Fig. 1.



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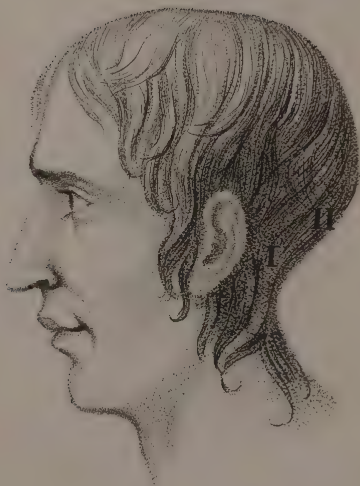

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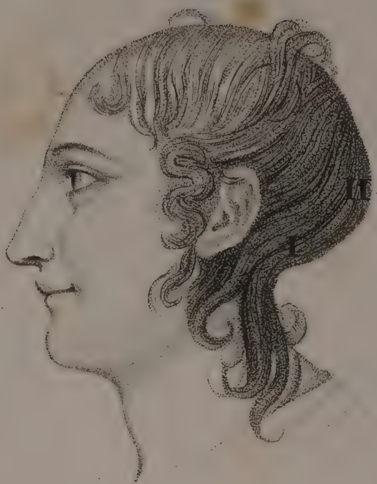
Fig. 1.



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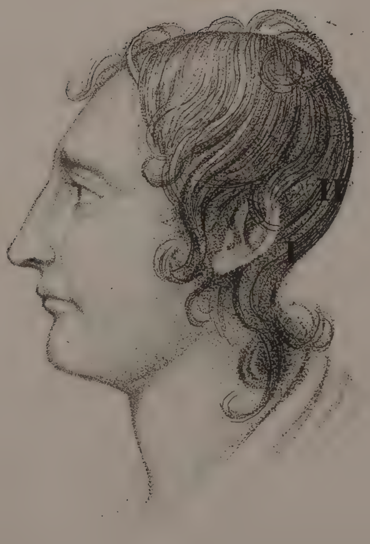

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Fig. 2.

Fig. 1.

Fig. 4.

Fig. 3.

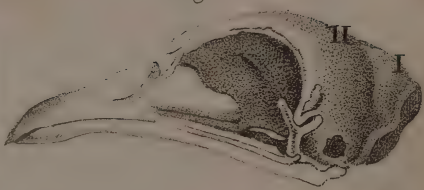

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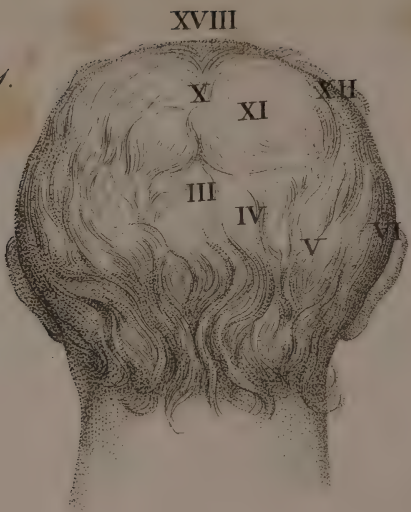
Fig. 1.



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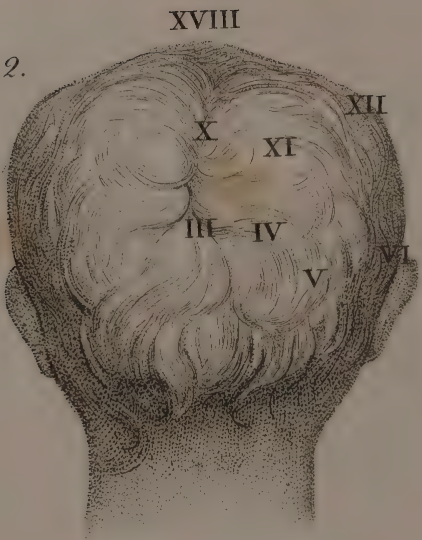

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Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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Fig. 1.

Fig. 2.

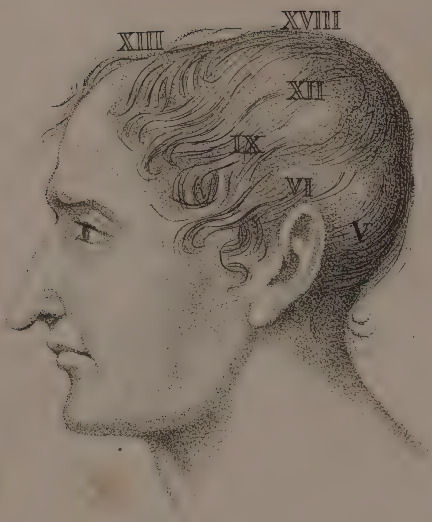

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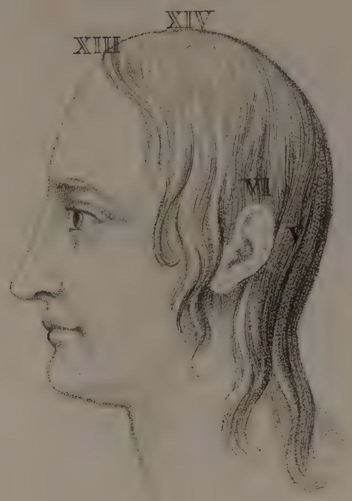
Fig. 1.



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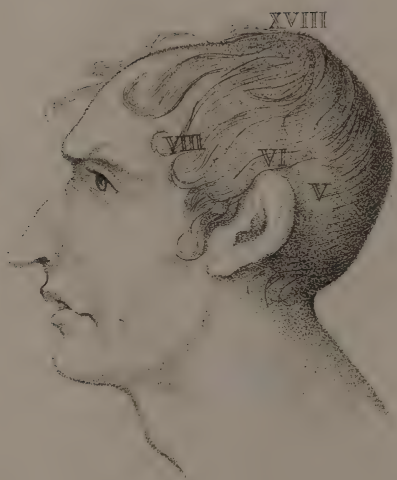

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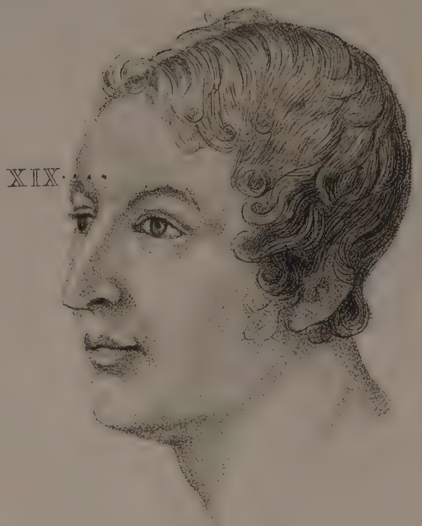
Fig. 1.



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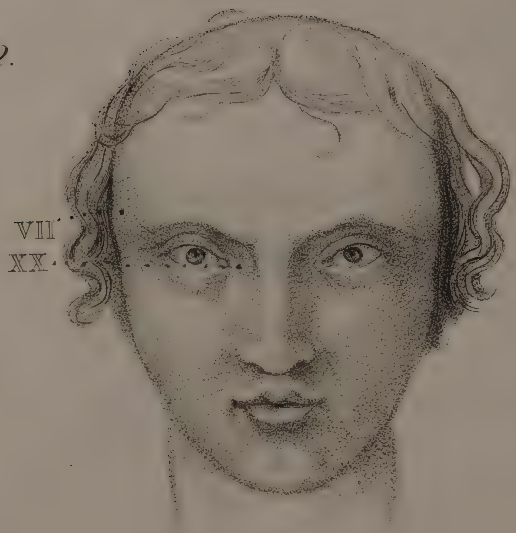

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Fig. 1.

XXIII

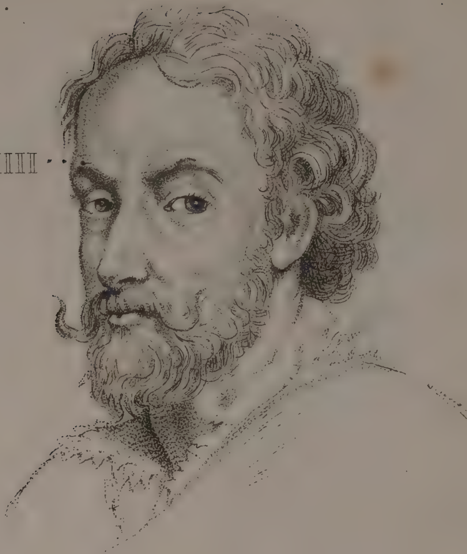

Fig. 2.

XXIV

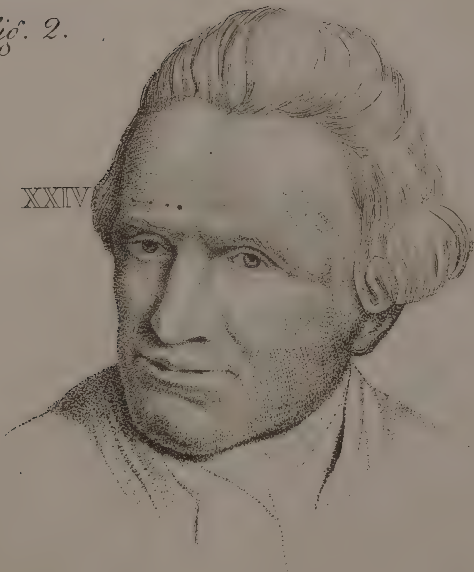

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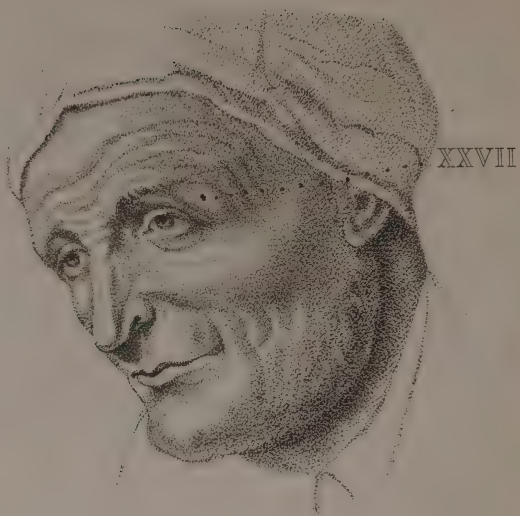
Fig. 1.



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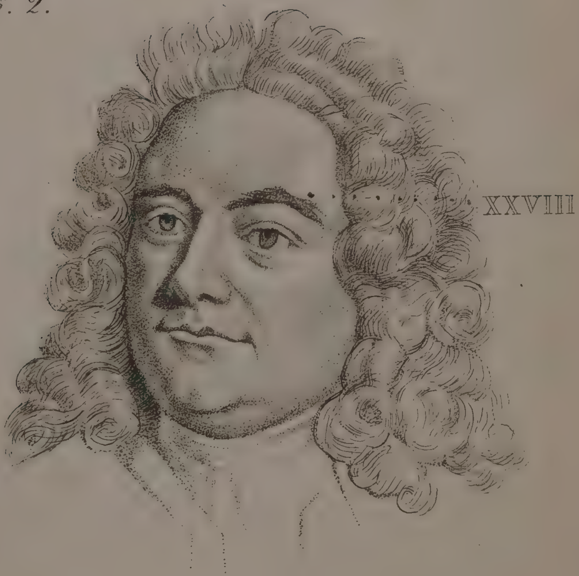

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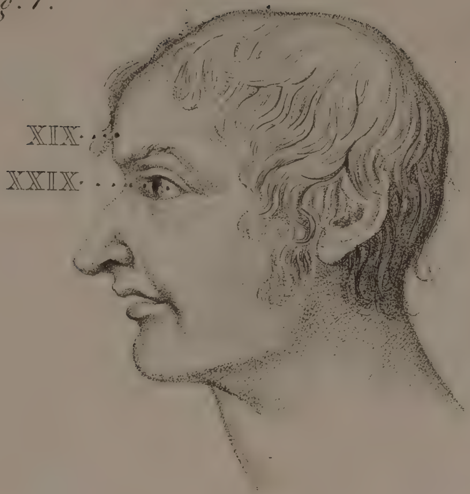

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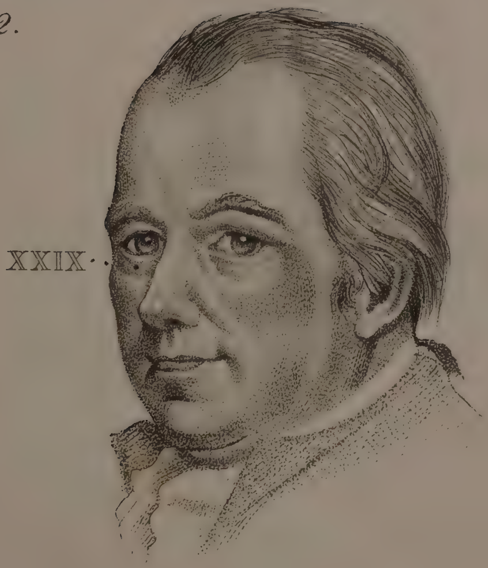

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Fig. 1.

XXX

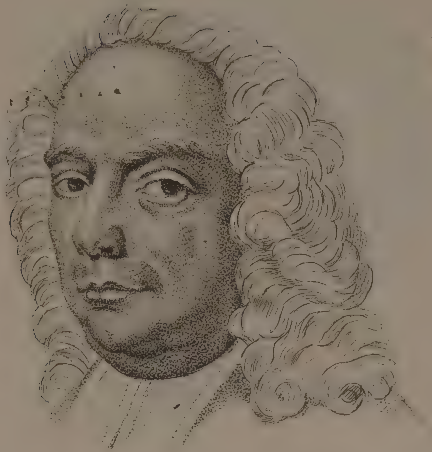

Fig. 2.

XXXI

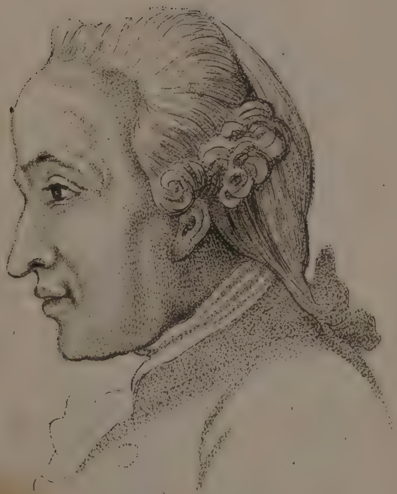

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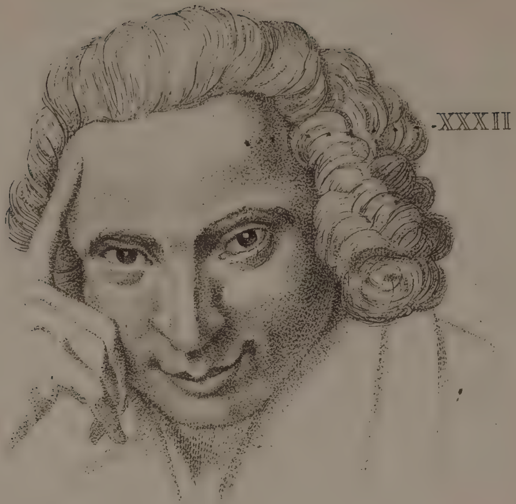
Fig. 1.



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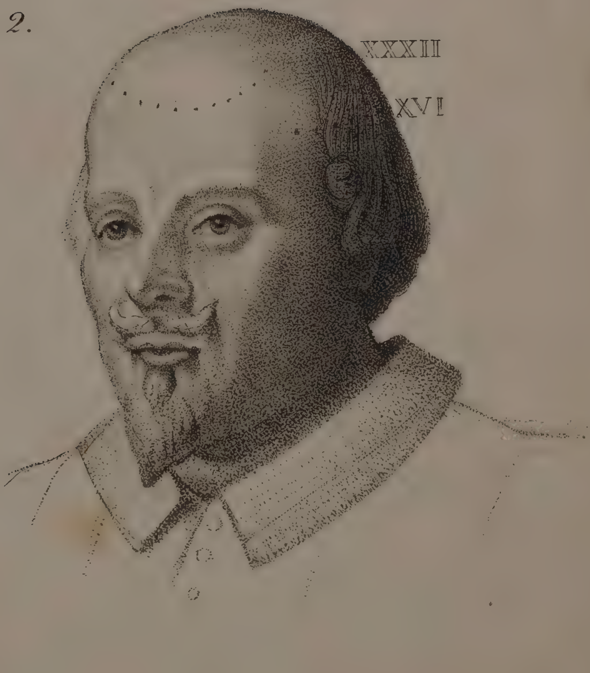

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